CITY GOVERNMENT.

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AMERICAN WATER WORKS CONVENTION

Opens at Columbus with a Large Attendance from all Sections of the Country.

First Publication of the Most Important Papers of the Convention in Full.

(Special Telegram to City Government.)

Columbus, Ohio, May 16.—The nineteenth annual convention of the American Water Works Association opened here to-day. The first session was called to order soon after 10 o'clock this morning by President Bond in the convention hall of the Great Southern Hotel. There were about three hundred members present, and many others are expected to arrive to-day and to-morrow. The convention promises to be one of the largest and most interesting ever held by the association. The local committee, headed by Jere O'Shaughnessy, receives the delegates in royal manner and will furnish splendid entertainment for them during the week. The election of officers, which occurs to-morrow, is being discussed freely to-day. Those mentioned for the presidency are: William R. Hill, of Syracuse, and C. P. Allen, of Denver. There is some opposition to the re-election of Secretary Milne, but it does not seem to develop sufficient strength to be effective.

"City Government" is the first paper to publish the important papers presented to the convention. The papers, in full, follow:

HOW THE WATER SUPPLY OF THE CITY OF SYRACUSE HAS BEEN KEPT FREE FROM AN UNPLEASANT TASTE.

BY WILLIAM R. HILL,

CIVIL ENGINEER, SYRACUSE, N. Y.

The purification of water is an art that has attracted the attention of man since the early ages. The ancient scribes wrote: "All the Egyptians dug around about the river for water to drink, for they could not drink of the water of the river." Thus it appears that for many generations, and perhaps ever since the beginning of the world, some waters have been affected with an unpleasant taste. In the year 1878, Elwyn Waller, Ph. D., made a report to the health department of the city of New York on the subject of an unpleasant taste and odor that made its appearance during several summers in the water supply of that city. At Croton Lake, the source of supply, it was noticed that a bright green substance appeared in the water near the dam. This material, which was considered the cause of the trouble, was driven by favorable winds to the outlet of the lake, where it accumulated and formed a considerable stratum in a quiet recess near the shore. Professor Waller enumerated sixty-one places in the United States where the water supply had been affected with an unpleasant odor and taste. At most places they attributed the cause of their trouble to the presence of decayed vegetable matter. In some instances they found temporary relief by cleaning their reservoir, but in most cases they were obliged to use the bad tasting water until it was improved by some condition of the season. Professor Waller in his report concludes as follows: "To sum up, some of the phenomena of odors and taste in the water supplies are in all probability due to the presence of certain forms of vegetation, but our knowledge of the subject is at present so unsatisfactory that no means of anticipating or preventing such phenomena can as yet be recommended. On the other hand, such odors and tastes, though undoubtedly unpleasant, have never, as yet, proved deleterious to the health of any community where they have occurred, so far as any records go." In a report of the Massachusetts State Board of Health for the year 1890, G. H. Parker, biologist, says: "The only effective means that I know of by which organisms can be removed in quantities from water is filtration."

It is not my purpose to explain any method of filtration, but to describe a simple operation by which the water supplied to Syracuse has been kept free from vegetation, the decomposition of which would cause a disagreeable "fishy" taste. In the latter part of May, 1896, the water in the distributing reservoir of that city was so unpleasant to the taste that it was almost unfit to use. It was necessary to empty and clean the reservoir. While this was being done, the city was supplied with water directly from Skaneateles Lake.

Before explaining the cause of the contamination of the water at that time, or the means employed to guard against pollution since then, it would be well to give a brief description of the quality of the water and the character of the water works system. The water is remarkable for its clearness and is of good quality, as is shown by both the bacteriological and chemical analyses. Dr. William H. May made several examinations each month during the last three years and found the average number of bacteria per cubic centimeter for each month to be as follows:

	1896.	1897.	1898.
January	6	4	3
February	5	3	5
March	8	6	5
April	7	8	7
May	13	7	6
June	18	14	12
July	26	16	14
August	20	19	20
September	15	18	18
October	12	12	9
November	6	6	5
December	4	5	4

Dr. May reports that no organisms derived from fecal matter, no sewage nor disease producing germs were found and that the water was remarkable for its purity.

In the month of February, 1899, an analysis of water drawn from a faucet was made by F. E. Englehardt, Ph. D., who found the following in parts per 100,000:

Solids, volatile and organic	4.50
Mineral matter	7.00
Total solids left at 212 degrees Fahr.	11.50
Temporary hardness	4.89
Permanent hardness	3.98
Total hardness	8.87
Chlorine	0.40
Nitrates	slight trace.
Free ammonia	0.00052
Albumenoid ammonia	0.00360
Oxygen consumed	0.28009

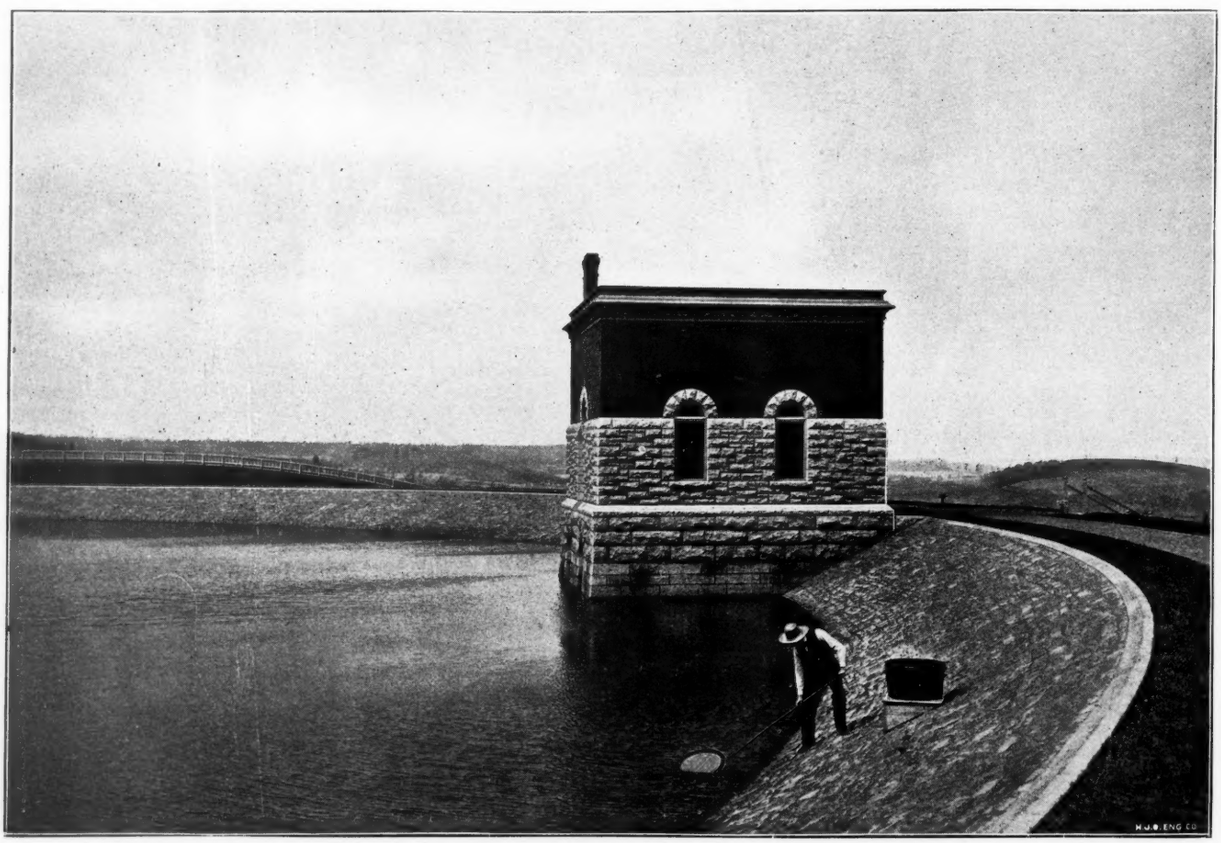
Professor Englehardt adds: "These results show the purity of our water supply."

Skaneateles Lake, the source of supply, is situated about nineteen miles southwesterly from the city, and at an elevation of 466 feet above the Erie Canal in Syracuse. The lake is fifteen miles long, about a mile wide, and has an area of 12¾ square miles. Its greatest depth is about 350 feet. Its shore is composed almost entirely of shale rock and is free from swamp and vegetable growth contiguous to the water. The watershed is steep and narrow, and has an area (exclusive of the lake) of 60.28 square miles. The hills surrounding the lake reach to an elevation ranging generally from 500 to 1,200 feet above the surface of the lake. Consequently the rain water reaching the lake very soon after falling is less liable to contamination, as it does not flow through long or sluggish streams or swamps.

The water is taken from the bottom of the lake at a depth of 40 feet and about one and a quarter miles from the shore, at which place is sunk a timber

crib. The water is drawn from the crib by gravity through a steel pipe 54 inches in diameter to the wells of the gate house on the shore. At the crib the water passes through a wire screen of one-inch mesh, and at the gate house through one of a quarter-inch mesh. A thirty-inch cast iron conduit, which is 19¼ miles long, commences at the gate house and terminates at the distributing reservoir. Between the crest of the dam at the lake and the flow line of the reservoir there is a fall of 245 feet.

The distributing reservoir has an area of 14 acres and a capacity of 121,000,000 gallons with the water 35 feet deep. The bottom and the lower part of the sides are covered with concrete, while the upper part of the sides is paved with stone laid in cement mortar. The water enters



SKIMMING THE RESERVOIR, SYRACUSE WATER WORKS.

the reservoir at the southern end, and from the northern end it is distributed by gravity throughout the city.

On the 29th day of June, 1894, the gates in the well house at the lake were opened and the water for the first time began to flow from Skaneateles Lake to Syracuse. At first it was discharged into an old reservoir, the bottom of which was covered with clay puddle. The city was supplied from this reservoir until September 21st, 1894. After that it was supplied directly from the lake until July 23d, 1895, on which date the surplus water (flowing in the conduit) over what was required to supply the city was turned into the new distributing reservoir. This was filled about the middle of August, 1895, and after that the city was supplied with water from it.

About the middle of May, 1896, a complaint was received at the office of the water department that the water tasted bad. Upon examination, but a very slightly unpleasant taste could be detected. After that the complaints became more frequent, as the water was becoming more and more disagreeable. On the 20th day of May it was very unpleasant to drink on account of the strong "fishy" taste and disagreeable odor. On this date the water in the reservoir had attained a temperature of 57 degrees Fahr. for the first time that season. The water entering the reservoir from the lake was ten degrees cooler and was perfectly free from any unpleasant taste. This water was immediately turned into the distributing system and the supply from the reservoir was shut off. The distributing system was emptied of the disagreeable water by opening the hydrants on the outskirts of the city, and in a few hours the people were supplied with a good potable water.

The reservoir was then emptied, the disagreeable odor increasing as the water was lowered. In the bottom of the reservoir at the foot of the slope, a dark green gelatinous substance was found. When this was partly uncovered of water it broke apart and the edges curled up, disclosing that the under side was a dark maroon color. It was from an eighth to a quarter of an inch in thickness, and the stench from it was almost unbearable. The reservoir was cleaned and refilled with water on July 10th, 1896, after which the city was supplied from it and no further trouble was experienced that season.

During the spring of 1897 the water in the reservoir was very carefully watched, both as to its odor and appearance. About the first of June fine black specks were noticed floating in places near the shore. Upon close examination (without the aid of a microscope), these particles were found to have the appearance of very small flies. Although at first they were very few, still they were thoroughly skimmed off. After that they were found and removed each day.

A few days after their first appearance a very fine, dry, yellow substance about the color and appearance of yellow corn meal was seen floating upon the surface of the water. This, like the dark particles, although developed over the entire area of the reservoir, soon floated close to the shore. The greater portion of the yellow substance formed into little balls as it was being carried to the shore. These balls could be easily skimmed off by a skimmer made of cheese cloth, but the separate particles were so fine that they would pass through the cloth, and in order to remove them it was necessary to use a tin vessel. There was no odor from them when first developed, but in less than twenty-four hours after they were skimmed off they would decompose and have a very strong odor similar to that of decayed fish.

During the summers of 1897 and 1898, both substances have appeared and have been removed from the surface of the water every day from about the middle of May until the first of September, the greater quantity from the first of June until the middle of July. They were found most abundant after a warm night, when quantity from the first of June until the middle of July. They were found most abundant after a warm night, when about enough to fill a peck measure

would be taken off. A slight breeze would carry them to the shore, as they were very light and floated upon the surface of the water. They were skimmed off each day, the work ordinarily requiring the services of one man; but on a few occasions when there was scarcely any breeze, it has required the work of six men.

They are spore and algae organisms and are so minute that they are passed unnoticed by casual observers. They will not contaminate the water if they are removed before decomposition takes place, neither will the gelatinous substance form in the bottom of the reservoir. Not the slightest taste or odor to the water has been detected during the last two summers. Although the water in the lake reaches at times a temperature of 80 degrees Fahr., still these organisms do not develop in it. It may be that they are consumed or otherwise destroyed in the lake by other organisms which cannot exist in the reservoir because of the cement lining.

AN OBJECT LESSON.

BY CHARLES E. BOLLING,
SUPT. WATER WORKS, RICHMOND, VA.

Believing experience to be one of the best teachers, I submit a few results obtained by placing meters on some of the taps, manufacturing and domestic, in Richmond, Virginia. In order to be clear, and that others similarly situated, and operating under like conditions, may compare and determine the analogy, I deem it best to describe our situation, history, and condition. Richmond was one of the cities early to construct water works at municipal cost. In 1830, the first pumps and reservoirs were constructed, and were designed to supply a population of 16,000 people. The plan adopted was to pump water, by water power, into a reservoir high enough to furnish water by gravity.

Richmond, like ancient Rome, is built upon seven hills, divided by deep ravines. The part first built up and supplied with water was on the lower hills and valleys, and the city, as it grew, spread out on the higher plains and hills. In the beginning, there being no sewers, a single hydrant sufficed, and often served to furnish water to several adjacent premises, even as in former days, a number of the citizens had gotten their water from one spring or well in the neighborhood. From time to time, as the demand arose, pumps and mains were added. Then—after sewers were built—there was a demand for greater conveniences and luxuries, at higher points, and on upper floors of houses, 'til finally a larger reservoir on a more elevated site was requisite. When this was completed, the result was greater pressure and greater waste.

I was placed in charge of the works in 1885. My greeting was an urgent demand for more water. At that time the pumping and delivering capacity was 24,000,000 gallons per day, and the population 70,000.

After carefully studying the distributing system, I divided it into three districts or services—high, low and intermediate. The low-lying district was furnished from the old reservoir, one main from the new reservoir supplied the middle district, and another the high district. Relief was quickly given the high one, but the intermediate district, which covered nearly three-fifths of the whole consumption, was not greatly benefited, due both to the great variation in elevation, differing as much as 180 feet, and to the great waste from the fixtures at the low points, the plumbing in these localities being the oldest and the worst.

In evidence of the rapid increase in consumption: The daily per capita in 1870 was 45 gallons; in 1880 (after the new reservoir was built), 92 gallons, and in 1890, 168 gallons. Citizens living on the high points had no water for fixtures on the second floors during the day, and the risk from conflagration, for want of pressure, was serious. The question presented was mains or meters. Additional mains carried with them additional pumps. The estimated cost was $270,000.

From the beginning I was convinced that the meter system was a necessity for a city like ours, and from the first had urged its adoption. It is the same old story of opposition and postponement. Finally, after years of pleading, complaint became so loud that something had to be done. In the spring of 1897, the city council appropriated $15,000 for the purchase of meters, and I was empowered to place them where I deemed best. I commenced setting the meters in June of that year, and placed them, irrespective of the size or condition of the premise, on the lowest plain. Nearly all the taps in this section supplied small dwelling houses, having two fixtures, a hydrant and closet. The average consumption at each tap per month was nearly 30,000 gallons, and in a few instances reached as high as 140,000 gallons per month. This great waste was at once checked by the meter, or rather the bill, and at the end of the year, the pressure at the high points had increased 40 per cent.

Another appropriation of $5,000 for meters was made in 1898. They were set in the low districts and at the end of the year the pressure had increased 100 per cent. at the high points. All complaint for want of water had ceased, and we had the same pressure at the points that would have been obtained by expending $270,000, which would have entailed an annual expense of $17,000.

Prior to placing the meters, our water power pumps were insufficient to keep up the supply, and we were often compelled to run the steam pump, which increased the cost of pumping $2,500 per annum. This pump has not been used for the past eighteen months. It will be seen, therefor, that the saving per annum amounts to $19,500, nearly equal to the entire outlay for meters.

The per capita consumption for last year—1898—was 99 gallons per day, a reduction of 41 per cent. from that of 1890, and the quantity of water used now is 27 per cent. less than in 1890, while the population has increased 20 per cent.

Another advantage from the meters: In the past, during freezing weather, it was the general custom to leave fixtures running and wasting to prevent frozen pipes. The result was little or no pressure, reservoirs rapidly emptying, in the face of the fact that all the pumps were worked to their full capacity. Recently, we have experienced the severest weather known in my section of the country, the thermometer for days being at or below zero. During that period a fairly good pressure was maintained in the city, even at the high points, and our water power pumps- were abundantly capable of preserving the supply, and keeping the reservoir full.

SOME DIFFICULTIES IN OBTAINING A WATER SUPPLY.

BY WILLIS J. MILNER,
SUPT. WATER WORKS, BIRMINGHAM, ALA.

The prominence in the industrial world now assumed by Birmingham is my justification for the subject of this paper, feeling assured, as I do, that the members of this association are always interested to know what their far-away neighbors have done and are doing along the line of our inquiry. I trust also that I may be pardoned if I have chosen a subject, of which I may say with Aeneas, I have been a great part—one with which I am therefore the more conversant.

In order to appreciate the difficulties encountered in providing an adequate supply of water at Birmingham for a great industrial city, it is necessary to understand its geographical situation and physical surroundings. Excepting small areas in the north end, and the southeast corner of the state, Alabama is drained by two principal river systems, viz: The Alabama, which, with its tributaries, drains the eastern half, and the Tombigbee and its tributaries, which drain the western, both uniting in the Gulf of Mexico at Mobile. The divide between the water-sheds of these two systems is a ridge extending from near the centre of the state to near its northeastern corner, and beyond, rising about 400 to 500 feet above the adjacent plain, and known locally as Red Mountain, so called from the Red Hematite iron ore it contains.

Birmingham is situated on the northwestern slope of this mountain, the corporate limits extending nearly to its summit and spreading out in the valley below. Geologically, the valley, which is about three miles in width, is silurian limestone. Within this valley there are numerous limestone springs, but their available capacity is insufficient, and all are liable to contamination, while the larger streams are far removed. Further, geological conditions make a ground supply impracticable.

These conditions brought about, in the earlier days of the city, a struggle to keep pace with the demand. The first pumping station, erected more than twenty-five years ago, about two miles north of the centre of the city, took its water from a small stream having its source adjacent to the then village. In time population extended over the water shed of this stream, rendering it unfit for use. It was at this period of its history that Birmingham afforded the statistics exhibited by Prof. W. P. Mason in his admirable work on "Water Supply," page 41, a condition now happily passed away, due largely to the improved supply of which I am about to give an account.

To reach a different source, in 1887 a canal was extended six miles northeastward from the pumping station to Five Mile Creek, a stream whose minimum flow is about 3,000,000 gallons daily.

The canal is mostly an open ditch, and for much of the way is hard blue limestone. As originally constructed it was four feet wide in the bottom with slopes 1 to 1, in earth, and nearly vertical in rock, having a grade of 1 in 2,500. At its lower end the water is conducted through a cast iron pipe under the valley of the stream formerly used, and delivered into a reservoir of about ten million gallons capacity, whence it is pumped direct into the distribution system. From two to three million gallons daily of the present supply is drawn from this source.

But just as this work was completed, and ready for the water to be turned into the canal, it was discovered that the owner of a small water mill, situated about twenty miles below, was about to file an injunction to restrain us from diverting the water. To say that we were in a desperate situation would hardly do the subject justice. It was November, one of the dryest months of the year. The old supply, bad as it was, was much too small. Street and lawn sprinkling had been stopped and hydraulic elevators and every other possible use discontinued. It became a race with the officers of the law, who gave us a friendly wink, to get the water turned into the canal before notice of the injunction was served. Victory rested with the company, but it was only temporary. To make it permanent the old mill was purchased at the owner's price, several times its value. His success was the signal for others, and to settle all other claims condemnation proceedings in the Probate Court were instituted and prosecuted to successful issue.

This work was scarcely installed before it required no prophet to see that no time must be lost in providing an additional supply. The only other available source was Cahaba River, a tributary of the Alabama River, the nearest point being nearly eight miles from the centre of the city. But to reach it involved great engineering difficulties and a large expenditure of money. Two mountain ranges, with many lesser ridges, and several smaller streams intervened. I remember well the comment of a member of this association, who, after the surveys had been completed, was invited to examine the situation, and make a bid upon the pumping engine. After a drive over the ground, and a look along the line and at the stream, said he: "I have been at the inauguration of many water works enterprises, but never before have I seen such exhibition of nerve."

Cahaba River is a stream of great fluctuations, its average daily winter flow, including East Cahaba Creek, being estimated at from 150,000,000 to 200,000,000 gallons, while its dry weather flow is estimated at less than 15,000,000 gallons daily. Its vertical rise and fall it was difficult to determine, but one noted freshet in 1872, known among the natives as the "July Fresh," was said to have risen forty feet above low water.

A pump house was designed to meet these conditions, circular in form, fifty-four feet in internal diameter. An excavation was made in earth and rock to about the level of the bed of the stream, and the entire surface covered with four feet of concrete, extending to the outside of the wall. The wall, which is of brick, laid in cement, is double, with a core of concrete five inches thick. It is fifty inches thick at the bottom, and reduced by off-sets to forty inches at the door sill of the first opening, which is at the level of the boiler room floor, thirty-two feet above the bottom. Above this level the wall extends fifteen feet and is surmounted by a conical roof. Ample light and ventilation are afforded by windows above high water. It is well provided with ventilating fans, and an electric light plant. A masonry inlet, 3 1-2x4 feet, extends from the river to the pump well, just outside the building.

The machinery is of the horizontal type, and consists of one Worthington high dump pump, cylinders 28 3-4 and 57 1-2 inches, plungers 19 inches and stroke 48 inches, with combined air pump, and having a capacity of five million gallons daily; and one Knowles, direct acting, duplex, compound-condensing pump, with outside packed plungers, and independent air pump, cylinders 30 and 60 inches, plungers 24 inches and stroke 36 inches, and having a capacity of eight million gallons daily.

There are twelve return tubular steel boilers, 60 inches diameter and 16 feet long, each with separate setting, so that any one may be cut out for repairs or cleaning.

Coal is supplied from the company's own mine, situated less than a half mile away, whence a little narrow gauge locomotive of about five tons' weight brings the coal cars as they are loaded in the mine to the boiler room door. After being weighed, they are then caught up on an overhead track extending through the boiler rooms, and dumped directly in front of the boiler doors. A separate swinging car returns the cinders by means of the same overhead track to a dumping car just outside the door. Does any one know of a water company that mines its own coal, and gets it delivered so cheaply and conveniently?

From the pumping station the pipe line ascends abruptly, rising 380 feet in the first half mile. To this point two 20-inch mains, one for each engine, are extended and connected to a stand pipe, 55 feet in height and six feet in diameter. From the stand pipe a 30-inch cast iron main extends, over rugged ground by an undulating grade, 12,500 feet to the reservoir. Blow-offs are provided at the depressions and air cocks at the summits. Much of the excavation is in rock.

There are two reservoirs located in a gap upon Shades Mountain, at an elevation of 400 feet above the river and 220 feet above and nearly five miles from the city. These reservoirs are natural basins, formed simply by building three dams across a valley, and removing the vegetable matter from the bottom. The dams are constructed of clay, with a small natural admixture of sand and gravel, moistened and thoroughly rolled with a grooved roller, in layers from five to six inches in thickness, of uniform texture, without any core wall of either puddle or masonry. The slopes are two to one on both sides and are protected by a rip-rapping of sandstone. They are 18 feet on top, and their maximum heights are respectively 43, 32 and 18 feet.

The first reservoir, that is the one nearest the pumping station, covers an area of seventeen acres and has a capacity exceeding 110,000,000 gallons. The other—the two being separated by a dam— covers five acres and has a capacity of 28,000,000 gallons. This reservoir is paved throughout with rip-rapping of sandstone.

The delivery and outlet pipes of these reservoirs are arranged so that the water may be pumped into or drawn from either or both reservoirs, or it may be pumped around them, direct into the city. Usually it is delivered near the bottom of the first reservoir and is drawn out near the top into the bottom of the second, from which it is drawn near the surface into the main, thus securing the full benefit of circulation and sedimentation.

From the reservoir the pipe line is about at right angles to the trend of the mountains. On the line are one large creek, and two tunnels, one 150 feet and the other 2,100 feet in length. The latter is through Red Mountain, and in its construction great difficulties were encountered. The northwest portal is in hard limestone, while the other is in stiff, waxy, blue clay. Between the two were encountered chert, shale, sandstone and iron ore. Slides of slushy material from the top were very troublesome, and greatly enhanced the cost. In rock the section is 7x12 feet. In earth the excavation was sufficient to admit outside of the masonry a timber arch of 12-inch timbers.

From the reservoir to the northwest portal of the tunnel, which is substantially the corporate limits, a distance of 16,200 feet, the main is 30-inch diameter, and is laid to a hydraulic grade of 1 1-2 per 1,000, being calculated for a delivery of about 11,000,000 gallons daily. From this point 9,400 feet of 24-inch pipe extends to the centre of the city, being connected to the lateral mains at all street crossings.

The distribution system consists of about sixty-six miles of mains of all sizes. This, briefly, is the physical plant.

The quality of the water is excellent, though at times somewhat roiled. The effect of this improved supply is apparent in the health statistics. Dr. Mason, in his book above referred to, gives the death rate from typhoid fever, prior to 1890, at 26.4 per 10,000. Last year the total deaths from typhoid fever originating in the city, out of a population of 40,000, was only eight, and of these eight only five were using hydrant water, another palpable evidence of the value of good water to a community.

Some other statistics may be suggestive, and specially interesting to our friends who sell meters, since only about 11 per cent. of attachments are metered. The daily average consumption for the months of September and October for several years past have been as follows:

Year.	Total gallons.	Per capita
1891	5,787,996	170
1892	6,528,753	186
1893	6,546,426	188
1894	7,827,436	217
1895	9,463,243	255
1896	10,266,433	296
1897	7,608,904	200
1898	9,189,386	229

WHAT IS A GOOD, PURE, WHOLESOME WATER?

BY W. P. MASON, PH. D.,
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What is a "good, pure, wholesome" water?

Adjectives such as the above, with the occasional addition of the expression "clear," are commonly found in the contracts made by private water companies with the cities which it is their business to supply.

Litigation over an alleged violation of such a contract having been instituted, it usually becomes the duty of some expert witness to pass upon the question as to whether or not the water under consideration is of such a quality as to fall within the limits specified by the wording of the agreement.

To the average layman there would appear to be no ambiguity in describing a water as "good, pure and wholesome," and he would see no objection to demanding that the words be descriptive of every public water supply in the country, and that the water companies, wherever located, be forced to live up to the exact and literal meaning of each and all of those words.

To show, however, that the above expressions are somewhat loosely used and

that they lack in the definiteness which is expected of them, let us consider them separately for a moment.

What is a "good" water? Surely before answering we must inquire: "Good for what?" If for drinking, then its consideration would properly come later when we dwell upon the expression "wholesome." Outside of the question of potability, a water charged with calcium sulphate may be very "good" for the brewing of light ale and very "bad" for either boiler or laundry use. It is to the selenitic character of its water that Burton-on-Trent largely owes its reputation as a great ale producing centre, for the properties which are so popular in the brews of Bass and Allsopp seem to depend upon the presence of calcium sulphate in the water from which they are made. Such a water would, however, be very unacceptable to the large laundry interests of Troy, N. Y., where the daily soap consumption is measured by the ton. In this connection some idea of the loss following the use of a hard water for laundry purposes may be obtained, by recalling that it requires fifty pounds of extra soap per million gallons of water used, for each "part per million" of increased hardness in the water.

Perhaps the most striking instance of complaint against a "good" water, a water really excellent at its point of collection, is reported in a recent issue of "Stahl und Eisen."

It seems that at Johann-on-the-Saar, a soft and very pure water, highly charged with carbonic acid gas, and consequently most desirable for drinking purposes, became brown and unfit for use after passing through the street mains, because of the action upon the metal by the gas in question. Here, then, is a water of such high worth that any citizen would be glad to have it furnished for his table, and yet it is so damaged by the iron piping of the streets as to reach the consumer in a most unacceptable condition. The city mains are hardly to blame, for they are much the same the world over. Now how should we rate such a water, "good" or "bad," if we were called upon to interpret the wording of a contract in a closely contested case?

In a water controversy with which the writer was once connected, the responsibility of the water company ended at the city's reservoir, distribution being attended to by the municipal authorities. Now let us suppose that the character of the water in that instance had been similar to the German one above quoted, would it not have been highly probable that the water company would have insisted that the supply as they delivered it was eminently "good" and that they had consequently discharged their whole duty to the town.

As with "good," so with the word "pure." It is, as used, extremely ambiguous. Strictly pure water is a chemical curiosity, very difficult to prepare and perhaps still harder to preserve, as all know who have read about Sir Humphrey Davy's classic determination of its composition. The word in the contract manifestly cannot mean water such as that; but if not, then what does it mean? If some permissible limit of impurity be implied, what is that limit and what is the character of the permissible impurity? These are fair questions, and they are pressing for an answer.

We turn now towards the expression "wholesome," trusting that here at least we have a definite term concerning which no misunderstanding can arise. It certainly does sustain more close scrutiny than the two already considered; but even this word, of apparently clear meaning, may be quite befogged by considerations that remind us of the old adage, "What is one man's meat is another man's poison."

How often we note that a change from a soft to a hard water, or vice versa, is followed by intestinal derangements, particularly among young children; a change of water being often nearly, or quite, as pronounced in its results as a change of air.

In view of this we begin to feel that Webster's definition of "wholesome" as "tending to promote health," may not strictly apply to the case in question; for it seems not unlikely that a shrewd cross-examining lawyer might very readily force the witness to admit that the water was "wholesome" for a part of the community only, namely, those who were acclimated, who had become tolerant to its use.

What has been said regarding change in hardness applies with equal force to variation in turbidity. In the stranger unaccustomed to its use, a turbid water will often produce a transient form of intestinal disturbance. Shall we therefore declare such a water to be unwholesome? If so, our verdict would to a certainty be opposed by many thousands of people living in our great central basin.

Appreciating the two horns of the dilemma, the writer has adopted this position, namely, assuming the absence of sewerage material and considering the silty turbidity alone, a somewhat turbid water is to be classed as undesirable for many purposes for which a city supply is used, but yet it cannot be rated as unwholesome, for the reason that it is unproductive of disease among the people for whose use it is primarily intended.

The writer, while on the witness stand, has given substantially the following answer to the question: "What do you mean by a good and wholesome water?" "Such a water should be suited to all forms of domestic use; it should possess no objectionable taste or smell; it should be free from animal, especially human, refuse material; it should be free from vegetable material in a state of active decomposition, distinction being made between such material and those stable extractive matters often found dissolved in brown or peaty waters, and which experience has shown are not prejudicial to health; finally, it should be free from such amount of suspended material of whatever character as would make it unsightly in appearance and unsuited to the ordinary industrial interests of a community."

Such an answer seems to be about as good as can be framed in reply to so general a question, but as has been indicated, it is not well to have the words do duty for too general a case. As we have seen, a water suited to the uses of one town might not be best for the interests of another; or perhaps even a portion of a city might, because of its manufacturing establishments, desire a different water from that sought after by the residential section of the same community.

In conclusion, let a word be said about a matter that has recently awakened no small degree of general interest.

It would seem that the attention of the public has been largely drawn of late to the question of the wholesomeness of distilled water for dietetic purposes, numerous articles having issued from the press under such captions as "Poisonously Pure Water" and the like.

Much uneasiness has been created among those who have substituted the use of distilled water for domestic purposes, in place of some city supply of acknowledged impurity, because of their being told that "distilled water is an active protoplasmic poison, due to its property of extracting salts from animal tissues and causing them to swell up by imbition."

Stress is, of course, laid upon the increased danger arising from the use of such water by the young, whose tissues are in process of formation.

Surely it is only fair to insist that the burden of statistical proof be borne by those who advance this proposition, and that until such data are furnished we will rest our faith upon such facts as the following:

The Croton water supply of New York city contains 5.48 grains of solid matter per U. S. gallon, or 1.37 grains per quart.

One quart of water per day for a child would be a fair allowance, considering that milk is also a portion of the diet.

In consideration of the mixed character of human food, and the amount of mineral salt naturally occurring therein and added thereto as condiments, the withdrawal of 1.37 grains of mineral salts per day, by the substitution of distilled water for that drawn from the Croton river, would be a matter of too small importance for consideration.

Finally, let it be remembered that all the vessels of our navy condense their drinking water by means of the Baird condenser, and the navy medical authorities report most excellent results. Surely the bone and muscle of the "men behind our guns" speak for themselves.

It may be interesting to add that: "The Marine battalion, some five or six hundred strong, used distilled water from the ships all the time they were doing shore duty at Guantanamo, Cuba, and they had none of the enteric fever that prevailed so extensively in the Fifth Army Corps."

THAWING FROZEN WATER PIPES BY ELECTRICITY.

BY JOHN B. HEIM,
SUPT. WATER WORKS, MADISON, WIS.

We have passed through the memorable winter of 1899. A winter unprecedented for its severe and extreme cold beyond our recollections. To make it more memorable it endangered the water pipes, which had been laid below the frost line, as taught by previous experience. But as in all extreme cases, the winter brought with it a new discovery. With us at Madison, Wisconsin, the cold weather set in as early as the 24th of November, 1898. The thermometer never registering above the freezing point, and at times near and below zero, until the 24th of January, when a still colder spell set in, lasting for twenty consecutive days, registering below zero, and for several days it hovered at 26 and 28 degrees below. The extreme cold brought on a continuous freezing, crowding the frost downward, and reached, in places, the depth of six feet.

Our water mains have a covering of five feet and over, which naturally caused alarm and meant mischief. The more so with the service connections, as they are of a smaller diameter.

We luckily averted the freezing of our mains by an untiring care and watchfulness both day and night, by examining the hydrants, flushing the mains at the extreme ends to replenish the water, and

with a continuous flow of water at several extreme points, where there are but few takers, with the exception of a single block of a four-inch main. This block that froze is 660 feet long, with a taker for nearly every 33 feet, but with no sewer connections. These takers draw only a few pails of water a day and there were several dead services. The connections leading to this four-inch main froze gradually and in spite of all our flushing, caught the main for about 200 feet.

These different services, in contact with the main, acted as so many icicles and partitions and froze that part of the main. The hydrant in connection with this main we found in running order on the 13th day of February, and on the 15th of February we found it frozen, the thermometer then registering 40 degrees above. The curious fact was, that at every tap in the main, we found the main cracked both ways from the corporation cock, showing that the services were the cause of the freezing of the main.

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"By referring to tabulation due to arc only you will find the cost per arc lamp, $47.71, a reduction as compared with preceding year of 3¾ per cent. notwithstanding the fact that the enforcement of the eight-hour labor law (under which we are operating) increased our labor charges to the amount of 95 cents per lamp over that of the preceding year. To determine the total cost per arc lamp per annum the following charges may be admitted as covering the matter completely:"

	Per Lamp.
Interest charges, at per cent	$9.965
Depreciation charges, at 5 per cent	12.456
Taxes lost, 50 per cent. valuation at 1½ per cent	1.870
Water consumed	.338
Operating expenses	47.710
Total cost per arc lamp for year	$72.339

During the year $27,822.32 was spent for improvements and extensions, making the total cost of the plant to date, $371,724.82, of which $294,712.57 is charged to the arc system and $77,012.25 to the incandescent system.

The Middleboro Light Plant.

The year 1898 shows a marked change in the financial status of the municipal gas and electric light plant at Middleboro, Mass., a town of about 7,000 population, as for the first time during the period of five years in which the town has owned the plant it has made an earning over and above its operating expenses. The profit over and above operating expenses, as shown by the books of the plant for 1898, was $363.35. In 1897 there was a net loss of $1,949.41.

The expenditures of the plant for 1898, exclusive of maintenance and operating expense, amounted to $6,855.01, of which $3,467.78 was for interest, $1,000 for payment of bond and $2,387.23 for new construction. Deducting from this total of $6,855.01 the profits made from the sale of gas, electricity and wiring, $363.35, we get the total cash expended by the town for the plant as $6,491.66. The items for bond payment, $1,000, and new construction, $2,387.23, being deducted, leaves the cash cost to the town for light during the year $3,104.43, which includes interest and all charges for maintenance except depreciation.

For this $3,104.43 the town gets for street lighting 12 arc lamps all night, 12 arc lamps until midnight and 157 25 c. p. incandescent lamps until midnight. A fair price for the 25 c. p. incandescent lamps is $15 per year each, or a total of $2,355 for the 157. Deducting this sum from $3,104.43, leaves the total cost of the 24 arc lamps $749.43, or $31.23 per lamp per year.

Cost of Lights at Peabody.

Manager H. P. Hutchinson, of the municipal electric light plant at Peabody, Mass., has published his report for the year ending January 15, 1899. The amount expended for construction during the year was $3,482.43, making the total cost of the plant to January 15, $78,468.85. The report states the following interest and depreciation charges:

Interest at 4 per cent. on $74,986.42 for one year and on $3,482.43 for six months	$3,069 10
Depreciation at 5 per cent. on $54,820.79 for one year and on $3,482.43 for six months	2,828 10
Total interest and depreciation	$5,897 20

The operating expense, receipts from commercial lighting and cost of street lights are shown in the following extract from the report:

Running expense		$13,634 75
Sales of light in 1898	$5,775 32	
Shop account	28 13	
		5,803 45
Total cost of town lights		7,831 30
Incan. light sold town buildings		1,003 10
Cost of street lights		$6,828 20
Cost of street lights, exclusive of interest and depreciation:		
1,600 c. p. arc, per year, each		$39 02
32 c. p. incan. per year, each		14 08
Cost of street lights, including interest and depreciation:		
1,600 c. p. arc, per year, each		$72 72
32 c. p. incan. per year, each		26 64

On January 15 there were 181 arc and 16 incandescent street lights in operation. The average for the year was 170 2-3 arc and 12 incandescent lamps. The plant has 232 customers, using about 5,100 16 c. p. incandescent lamps. Street lights were run 3,645 hours during the past year.

Municipal Plant for Evansville.

Evansville, Ind., is soon to build and operate its own electric light plant. Frank B. Rae, the well known electrical engineer, has submitted to the board of public works of that city estimates on the cost of the plant and the expense of operating it. Mr. Rae's plans call for an entirely new system, everything of the latest and best in electrical invention, and he estimates the cost at $106,000, including building.

The machinery is to be of the latest patterns, direct connected dynamos and engines, giving the highest efficiency with the most economical operation while taking up the least room, allowing a much smaller building to answer all purposes than if belts and counter shafting are used.

Calculations are made for an arc capacity of 500 light and a similar incandescent capacity. The incandescents are to be used in the city hall, police station and fire houses to take the place of the present gas lighting. The estimates of cost and operation are based on the use of 367 arc lights to take the place of all gas and electric lights now used in street lighting.

The service will be an all night, every night one and each light will burn 4,000 hours. The lamps are to be of the enclosed pattern, with carbons burning eighty hours without retrimming. The light is said to be better than in the open lamps while there is greater economy in their maintenance. The style of lamp now used burns fourteen hours and has to be trimmed every day. The new ones would only have to be trimmed once a week. While carbons for the enclosed lamps cost $28 a thousand, they last nearly six times as long as those for the open lamps, which cost $7 a thousand to say nothing of the saving in trimming once a week instead of seven times.

Mr. Rae estimates the expense of operation at $55 per arc lamp per year. The present contract price at Evansville is $90 per lamp.

Opposed to Municipal Ownership.

In a recent interview, Major John Byrne, one of the heavy stockholders in the Detroit Gas Light Co., said:

"I do not believe a municipality can conduct a gas industry as economically nor as well as a private corporation. No matter how ably a municipality may conduct such an enterprise, and no matter how able the men may be who are at the head of it, the same incentive to conduct an economically successful business is not there. I am not qualified to speak intelligently on the street railway question. I will, however, say that I am generally opposed to municipal ownership and do not believe it is to the best interests of a community for a city to take upon itself the conduct of what should be individual enterprise. It takes away that incentive to individual enterprise and activity which is the life and wealth of our country."

Baltimore's Street Lamps.

The city of Baltimore, Md., has made a contract with Thomas T. W. Miner, of New York, for all street lamps to be required during the ensuing year. W. H. Swindell, superintendent of lighting at Baltimore, reports that 6,291 Miner lamps are now in use in that city, and 471 of them are furnished with Welsbach burners. Some officials seem to think that globe lamps are expensive to keep in repair; against this impression it is reported that the actual cost of replacing broken globes in Baltimore for the years 1897 and 1898 averaged 12 cents per lamp per year—just one cent a month.

—The annual meeting of the stockholders of the Joseph Dixon Crucible Company was held at the company's main office, Jersey City, N. J., Monday, April 17, and out of a possible vote of 7,345 shares, there were 7,069 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. President E. F. C. Young, Vice President and Treasurer John A. Walker, and Secretary George E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

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Allegheny Light Plant Report.

In the report of the Allegheny, Pa., bureau of public lighting for the year ended February 28, 1899, Superintendent David Hunter, Jr., makes a fine showing for public ownership and operation. Every item of expenditure is shown in the tables contained in the report, and the accounts for the arc and incandescent systems have been kept separate, so that an accurate statement of the cost of each light is presented. The report shows that the operating expenses per arc lamp, burning 3,976 hours, was $47.71 for the year. This amount includes $2.816 per lamp for office salaries, $2.108 for station labor, $12.786 for line and lamp labor and $23.994 for supplies and repairs. The report says:

"By referring to tabulation due to arc only you will find the cost per arc lamp, $47.71, a reduction as compared with preceding year of 3¾ per cent. notwithstanding the fact that the enforcement of the eight-hour labor law (under which we are operating) increased our labor charges to the amount of 95 cents per lamp over that of the preceding year. To determine the total cost per arc lamp per annum the following charges may be admitted as covering the matter completely:"

	Per Lamp.
Interest charges, at per cent.....	$9.965
Depreciation charges, at 5 per cent...	12.456
Taxes lost, 50 per cent. valuation at 1½ per cent.....	1.870
Water consumed	.338
Operating expenses	47.710
Total cost per arc lamp for year...	$72.339

During the year $27,822.32 was spent for improvements and extensions, making the total cost of the plant to date, $371,724.82, of which $294,712.57 is charged to the arc system and $77,012.25 to the incandescent system.

The Middleboro Light Plant.

The year 1898 shows a marked change in the financial status of the municipal gas and electric light plant at Middleboro, Mass., a town of about 7,000 population, as for the first time during the period of five years in which the town has owned the plant it has made an earning over and above its operating expenses. The profit over and above operating expenses, as shown by the books of the plant for 1898, was $363.35. In 1897 there was a net loss of $1,949.41.

The expenditures of the plant for 1898, exclusive of maintenance and operating expense, amounted to $6,855.01, of which $3,467.78 was for interest, $1,000 for payment of bond and $2,387.23 for new construction. Deducting from this total of $6,855.01 the profits made from the sale of gas, electricity and wiring, $363.35, we get the total cash expended by the town for the plant as $6,491.66. The items for bond payment, $1,000, and new construction, $2,387.23, being deducted, leaves the cash cost to the town for light during the year $3,104.43, which includes interest and all charges for maintenance except depreciation.

For this $3,104.43 the town gets for street lighting 12 arc lamps all night, 12 arc lamps until midnight and 157 25 c. p. incandescent lamps until midnight. A fair price for the 25 c. p. incandescent lamps is $15 per year each, or a total of $2,355 for the 157. Deducting this sum from $3,104.43, leaves the total cost of the 24 arc lamps $749.43, or $31.23 per lamp per year.

Cost of Lights at Peabody.

Manager H. P. Hutchinson, of the municipal electric light plant at Peabody, Mass., has published his report for the year ending January 15, 1899. The amount expended for construction during the year was $3,482.43, making the total cost of the plant to January 15, $78,468.85. The report states the following interest and depreciation charges:

Interest at 4 per cent. on $74,986.42 for one year and on $3,482.43 for six months	$3,069 10
Depreciation at 5 per cent. on $54,820.79 for one year and on $3,482.43 for six months.....	2,828 10
Total interest and depreciation...	$5,897 20

The operating expense, receipts from commercial lighting and cost of street lights are shown in the following extract from the report:

Running expense		$13,634 75
Sales of light in 1898.....	$5,775 32	
Shop account	28 13	
		5,803 45
Total cost of town lights.....		7,831 30
Incan. light sold town buildings....		1,003 10
Cost of street lights.....		$6,828 20
Cost of street lights, exclusive of interest and depreciation:		
1,600 c. p. arc, per year, each.....		$39 02
32 c. p. incan. per year, each.....		14 08
Cost of street lights, including interest and depreciation:		
1,600 c. p. arc, per year, each.....		$72 72
32 c. p. incan. per year, each.....		26 64

On January 15 there were 181 arc and 16 incandescent street lights in operation. The average for the year was 170 2-3 arc and 12 incandescent lamps. The plant has 232 customers, using about 5,100 16 c. p. incandescent lamps. Street lights were run 3,645 hours during the past year.

Municipal Plant for Evansville.

Evansville, Ind., is soon to build and operate its own electric light plant. Frank B. Rae, the well known electrical engineer, has submitted to the board of public works of that city estimates on the cost of the plant and the expense of operating it. Mr. Rae's plans call for an entirely new system, everything of the latest and best in electrical invention, and he estimates the cost at $106,000, including building.

The machinery is to be of the latest patterns, direct connected dynamos and engines, giving the highest efficiency with the most economical operation while taking up the least room, allowing a much smaller building to answer all purposes than if belts and counter shafting are used.

Calculations are made for an arc capacity of 500 light and a similar incandescent capacity. The incandescents are to be used in the city hall, police station and fire houses to take the place of the present gas lighting. The estimates of cost and operation are based on the use of 367 arc lights to take the place of all gas and electric lights now used in street lighting.

The service will be an all night, every night one and each light will burn 4,000 hours. The lamps are to be of the enclosed pattern, with carbons burning eighty hours without retrimming. The light is said to be better than in the open lamps while there is greater economy in their maintenance. The style of lamp now used burns fourteen hours and has to be trimmed every day. The new ones would only have to be trimmed once a week. While carbons for the enclosed lamps cost $28 a thousand, they last nearly six times as long as those for the open lamps, which cost $7 a thousand to say nothing of the saving in trimming once a week instead of seven times.

Mr. Rae estimates the expense of operation at $55 per arc lamp per year. The present contract price at Evansville is $90 per lamp.

Opposed to Municipal Ownership.

In a recent interview, Major John Byrne, one of the heavy stockholders in the Detroit Gas Light Co., said:

"I do not believe a municipality can conduct a gas industry as economically nor as well as a private corporation. No matter how ably a municipality may conduct such an enterprise, and no matter how able the men may be who are at the head of it, the same incentive to conduct an economically successful business is not there. I am not qualified to speak intelligently on the street railway question. I will, however, say that I am generally opposed to municipal ownership and do not believe it is to the best interests of a community for a city to take upon itself the conduct of what should be individual enterprise. It takes away that incentive to individual enterprise and activity which is the life and wealth of our country."

Baltimore's Street Lamps.

The city of Baltimore, Md., has made a contract with Thomas T. W. Miner, of New York, for all street lamps to be required during the ensuing year. W. H. Swindell, superintendent of lighting at Baltimore, reports that 6,291 Miner lamps are now in use in that city, and 471 of them are furnished with Welsbach burners. Some officials seem to think that globe lamps are expensive to keep in repair; against this impression it is reported that the actual cost of replacing broken globes in Baltimore for the years 1897 and 1898 averaged 12 cents per lamp per year—just one cent a month.

—The annual meeting of the stockholders of the Joseph Dixon Crucible Company was held at the company's main office, Jersey City, N. J., Monday, April 17, and out of a possible vote of 7,345 shares, there were 7,069 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. President E. F. C. Young, Vice President and Treasurer John A. Walker, and Secretary George E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

PAVING AND SEWERS.

The Local Improvement Act of Illinois.

(By A. D. Thompson, City Engineer, Peoria, Ill.)

The entire scheme of taxation as applied in its various forms at the present day is the outgrowth of the principle imposing a charge for particular benefits. The brightest intellect of all countries has been applied for centuries in the endeavor to devise a fair and impartial method for levying special taxes, but the systems now in use are as a general rule crude and unsatisfactory. Different methods with various degrees of merit have been adopted by the several states of the union, among which the statutes of Illinois have been remarkable because of their inefficiency.

The laws of this state, prior to 1897, controlling the levying of taxes in the form of special assessments and special taxation gave almost absolute power to the governing bodies of the municipalities. The City Council, or Board of Trustees, in cities and villages had the authority to originate plans for public improvements, pass ordinances for the construction of same, and levy taxes for the payment of the work. There was no provision limiting the amount of such taxes except that the property should not be assessed more than the benefits derived from the improvement. This clause gave but slight relief in the application of the act as the entire cost of the work was generally assessed against the contiguous property, thus placing the burden of proof as to benefits upon the complainant and the original tax was ordinarily not disturbed no matter how unjust it might be. The property owner was given no consideration until the case was taken into the County Court by the city to obtain confirmation of the tax. Even this hearing was denied in numerous cases because of failure to receive the single postal card notice of same, through negligence of the commissioners, the use of wrong mailing address or loss through the mails, and the first notice received of the contemplated improvement would be a notification to pay the taxes for its construction.

This act was manifestly unfair and caused a great amount of hardship among the middle classes of the larger cities, where large public improvements were many times promoted, regardless of their necessity or benefit and with no thought of the hardships imposed. The officials of the smaller places were deterred from such abuse of power by their more direct contact with the existing condition.

In the endeavor to obtain relief from this act a large number of real estate men and property owners in Chicago, formulated a bill controlling local improvements, which, after a number of modifications, was passed by the legislature and became a law July 1st, 1897. It is well to consider the merits of this act, after it has been in practical operation for more than eighteen months.

The following is a brief outline of the intricate workings of the new law as applied in the case of ordinary public improvements constructed wholly or in part by special assessment or special tax in cities having a population of 25,000 or more, according to the last preceding census of the United States:

There is created a board of five members known as the Board of Local Improvements, composed of the Commissioner of Public Works, City Engineer, Superintendent of Streets, Superintendent of Sewers and Superintendent of Special Assessments. All schemes for public improvements, payable wholly or in part by special assessment or special tax, must originate with this board, who shall pass a resolution describing the proposed improvement, containing an itemized statement of the cost signed by the engineer, and shall set a time and place for the public consideration thereof, the time to be not less than ten days after the adoption of the resolution.

A notice giving the time and place of the meeting and the estimated cost of the work shall then be posted in four conspicuous places in the vicinity of the proposed improvement, and also mailed to each person who paid the taxes the previous year on the property interested. In case the owners of at least one-half of the private property fronting on the improvement petition for same, the notices by mail may be omitted.

After the public hearing, the board decides to adhere to, modify or abandon the proposed work. In case of either of the first two decisions, an ordinance covering the proposed work and an estimate of the cost is presented to the Board of Aldermen with a recommendation for its passage signed by a majority of the Board of Local Improvements, and this ordinance and estimate are either passed or rejected by the City Council. If the estimated cost exceeds $100,000 the ordinance must be referred and published at least one week before final action.

In case the ordinance is passed, the city, through its proper officers, shall petition the County Court to levy a special assessment for the cost of the improvement provided by the ordinance, and the Court thereupon directs the Commissioner of Special Assessments to make such assessment upon the municipality and the property benefited. This officer thereupon assesses the cost upon the several properties and the city in proportion in which they are severally benefited, but no property shall be assessed a greater amount than it is actually benefited.

A stated form of notice shall be sent by mail to the persons who paid the taxes the preceding year on the properties affected, at least fifteen days prior to the time set for asking a confirmation of the assessment roll. Four notices shall also be posted in public places.

Objections to the report and proceedings may be filed with the court at any time prior to the time set for a hearing, and the judge has full power to act upon same. If it is objected that any property is not benefited the amount assessed against it, the question must be settled by a jury, unless it be waived by mutual agreement. If, after a hearing, there shall be a deficiency in the total assessment, this deficiency may be distributed by the Court among other properties in the district which is benefited, and a hearing must be given after notice. Should the first assessment prove insufficient for the work, a second may be made in the same manner.

A previous assessment for a similar improvement shall be no objection to the legality of any improvement. Provision is made for the division of the payments of the assessment when desired, into not more than five annual installments, except for sewer or water works, which may be divided into ten annual installments. Bonds bearing 6 per cent interest may be issued where the assessment is thus divided, to provide funds for making the improvement.

If there be no appeal perfected or other stay of proceedings within sixty days after confirmation, the work shall be advertised by the Board of Local Improvements in some newspaper and in two conspicuous public places, the time for opening bids to be not less than ten days or more than fifteen days thereafter. The board has power to reject any or all bids, but in case of award, it shall be made to the lowest responsible bidder within twenty days after the time for opening bids. In case the bids are all rejected the work shall be readvertised.

Notice of award of contract shall be posted for five days and advertised for two days in a daily newspaper. The owners of a majority of the property fronting on the street, may within ten days after the award take said work and enter into a contract to do the work at ten per cent less than the price at which it has been awarded.

The execution of the work proceeds in the ordinary manner under the direction of the Board.

The law applies, as outlined, to all cities and villages of the state, except in cities of 25,000 or less there are two modifications regarding the formation of the Board of Local Improvements and the manner of originating ordinances. The board in such places is composed of the Mayor, Engineer and Superintendent of Streets, or, where the two latter offices do not exist, the Mayor and two members of the Council or Board of Trustees. No ordinance for an improvement in such places can originate with the board except upon a petition of a majority of the property frontage along the line thereof.

The features of the law which have proved the most objectionable may be enumerated as follows:

First—The majority frontage petition requirement in cities of the second class before an improvement can be considered.

Second—The necessary approval of three separate bodies.

Third—The division of jurisdiction between two municipal boards.

Fourth—The personnel of the Board of Local Improvements in cities of the first class.

There is in this state, according to the United States census of 1890, but three

cities—Chicago, Peoria and Quincy—having a population of 25,000 or more. The act as amended, therefore, applies to all but three of the municipalities of the state, and no public improvement of any character can be projected in such places except upon a majority petition of the contiguous property. This restriction is sufficiently severe to seriously discourage public work; but its prohibitive effect is insured by a recent decision of the Supreme Court of the state in a case taken up from Bloomington, where it was decided that a majority petition of the property frontage along the entire improvement was not sufficient, but that such petition must contain a frontage majority in each block.

Like most legislation upon municipal matters enacted in this state, the act was was prepared to meet the conditions in Chicago, after which it was thrust upon all the cities of the state, with a few modifications attached, to indicate an attempt to meet their requirements. The circumstances differ so widely that such an adjustment is impossible, for the cloth must be cut to suit the case. A man's coat cannot be made to fit a four-year-old boy by simply shortening the sleeves.

The principal improvements of this law over the one it replaced is the consideration given the rights and wishes of the property owners, and this idea was guarded so securely that it has become one of the main objections to the act. The originators of the law in their anxiety to secure fair treatment in matters of special taxation encumbered it with so many safeguards and complications that it practically prohibits public improvements in cities and villages coming under the second class. This was evidently not their intention, and has become possible only through the abuse of the rights and privileges accorded therein.

A projected improvement must run the gauntlet of three separate and distinct bodies, before any and all of which the property owners may be heard, before a final settlement of the case. Numerous opportunities for delay are therefore offered irresponsible parties and obstructions are so easily placed that it is exceedingly difficult to carry an improvement through the complicated proceedings, to a successful finish in the face of the least opposition.

The work may be defeated at the hearing given by the Board of Local Improvements, by opposition in the council or by a technical objection before the court. It may be stated as illustrating the difficulties of carrying an improvement through these bodies that judgment has been obtained in Peoria on only 10.5 per cent of the work projected by the Board of Local Improvements during the past year.

The division of jurisdiction in improvement matters is a fruitful source for delay. One board should have full power to originate ordinances, hear objections, pass ordinances and control all proceedings until the case is taken into court for confirmation of the assessment. Under the present law the ordinances prepared by one board must be passed by another. This is an unwise stipulation, as many needed and desired improvements may be delayed or rejected on purely personal or political grounds, without any consideration of the merits of the case. If the Board of Local Improvements are authorized to hold hearings and investigate the conditions regarding the advisability of constructing any public improvement, they should also be given the power to complete this work by passing the necessary ordinances.

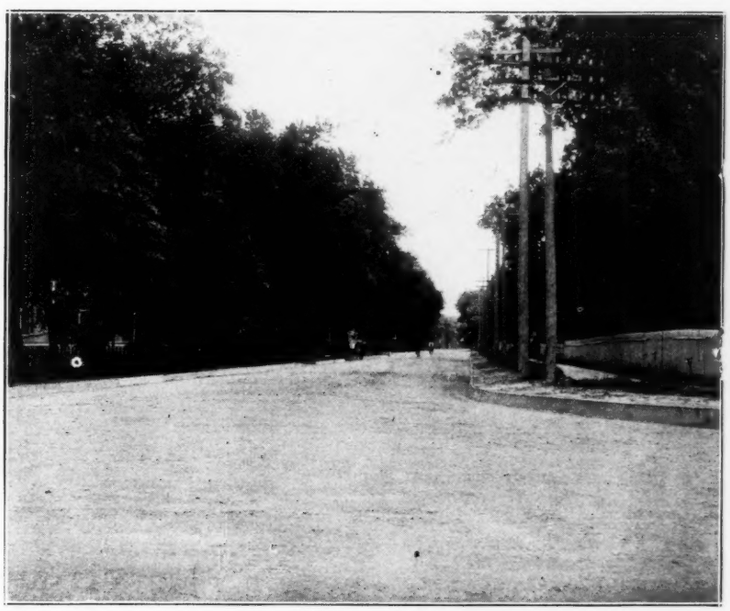
The composition of the Board of Local Improvements is a defect which might operate to the serious disadvantage of the interests involved. The members of this body in cities of the first class are certain officials appointed by the Mayor because of their fitness to fill the various positions, but who are not necessarily qualified to act in a judicial capacity to determine the questions that must be decided by such a board. To act upon such matters properly requires a broad, comprehensive view of the circumstances affecting each particular case, the ability to give proper weight to the individual and public interests and a judicial capacity to eliminate prejudices and personalities. Such qualities are rare, and it is no disparagement to state that they are not ordinarily possessed in the highest degree by the men designated to compose this board. These men are also in their official capacity directly subject to the orders of the council. The same criticism applies to boards in cities of the second class composed of the Mayor, Engineer and Superintendent of Streets, but not with as much force to the boards formed of the Mayor and two members of the council.

It would appear that the conditions might have been fairly met by a non-partisan board, if a separate one were needed, of successful business men elected by the people, in much the same manner as the park trustees. Such members to serve without pay and to have absolute power to originate plans for improvements, pass or reject the ordinances after a public hearing and levy the assessment without recourse to the court. Such a board would be better able to decide as to the necessity of any improvement, would not be influenced by personal or political consideration, would prevent the delays and obstructions now experienced and could complete the work decided by them necessary to be done.

These criticisms are not offered through a lack of appreciation of the many meritorious features of this act now in force, but with the hope that some action may be taken to remedy those portions of the statute which the various municipalities have in its operation found most detrimental to the public interests.

Macadamizing at Rockford, Ill.

In no city in this country can be found any better macadam streets than those of Rockford, Ill. The macadam work at Rockford is done by the city under the direction of City Engineer Edwin Main, who is an expert in this line. The city operates its own quarry and crushing plant, also, and is thereby enabled to make first-class macadam roadways at low cost. The illustration on this page shows the macadam pavement of Seminary street, 36 feet wide, laid last year at a cost of $1 per lineal foot, including curbing and grading. The street was brought to sub-grade and thoroughly rolled; then a five-inch layer of shoveled rubble was laid and thoroughly rolled; then a five-inch layer of crushed rubble limited to four inches in diameter and a top dressing of screenings limited to one-half inch in diameter, all thoroughly wet and rolled with a 15-ton roller. The curbing is 2x12 soft pine nailed to 7-inch half cedar posts. The macadamizing at Rockford is paid for one-half by special assessment and one-half by the city.



MACADAMIZED STREET, ROCKFORD, ILL.

Wants Better Streets.

Mayor L. G. Hunt, of Mt. Vernon. Ohio, in his annual message to the council, says:

"Many of our citizens are clamoring for better streets; they ought to have them. The almost impassable condition of our streets during the past winter ought to be an incentive to improve them. Some of the principal streets should be sewered and prepared for some kind of paving at the earliest possible moment; many of the less traveled streets could be put in good condition by using the road machine to give them proper grade and slope for drainage, then coated with good, coarse gravel and rolled with a heavy roller. I believe the city could make no better investment than the purchase of a heavy roller for use upon the

streets, and keep it at work until the streets are in a first-class condition. If the council will take a trip into Monroe township, or any other where they have in use road machines and a stone crusher, they can learn something of road-making. These roads are passable all winter to the corporation line of Mt. Vernon—then you get it up to the neck."

Asphalt and Brick for Buffalo.

Buffalo has for some years enjoyed the distinction of being in the front rank of American cities in the matter of street improvements. Asphalt has been used extensively in Buffalo and its popularity is well shown in the fact that out of the thirty street improvements to be made this season twenty-eight are to be of asphalt. Twenty of these new asphalt pavements are to replace stone, which is fast disappearing from the streets of Buffalo. Two very long stretches of brick pavement, on residential streets, are to be laid.

Sewer Ventilation in England.

An idea of English practice in sewer ventilation may be gathered from the following set of recommendations recently adopted at Lambeth, England, on the advice of the Sewers and Sanitary Joint Committee, as stated by "The Surveyor," London:

The freer the ventilation of sewers the better, as by such means the oxidation and dilution of sewer gases are effected, and the sewer gases thereby rendered practically harmless; that in a fairly wide road surface road ventilation is satisfactory, provided a sufficient number of open grids are supplied at regular intervals of not more than 100 feet apart; that shafts may with advantage be used in addition to open grids; that the sewers should be systematically flushed and cleared of deposits; that glazed pipe sewers should be substituted for small brick barrel sewers; that open grids in narrow streets and courts should be closed, and replaced by ventilating shafts; and that no difficulty should be placed in the way of the London County Council in their endeavor to relieve the pressure in the main sewers by the erection of extraction shafts in the form of large lamps placed upon street refuges.

Why Are the Sewers Not Used?

In a report upon the recent outbreak of typhoid fever at Oldburg, Eng., by the medical health officer, Dr. G. H. Fosbroke, it is stated by "The Surveyor," London, that no less than 87.2 per cent. of the persons attacked used cesspools or privies, 7.1 per cent. used water closets, and he concludes that the cesspools or privies acted as the centre of infection.

The most noticeable fact brought out in the report and which is of present moment to many American cities is that although this city, with a population of 24,915, is thoroughly sewered, there are 3,254 privies, 21 pail closets, 149 dry earth closets, 30 slop closets and only 328 water closets connected with the sewers.

This is a condition altogether too prevalent in many cities and towns in this country. People even after the introduction of sewers cling to these ancient and unsanitary methods, and the use of cesspools in unsewered towns has held up many a sewerage project, the users fully believing that because an epidemic never originated from their cesspool that it is perfectly harmless. It is to be hoped that the case cited will prove convincing that such arguments have poor foundation in fact.

Elements of Sanitary Engineering.

This book, by Professor Mansfield Merriman, (published by John Wiley, price $2.00), cannot be too highly commended to those who wish to make an intelligent, but brief study of the questions of sewerage, sewage and garbage disposal, water supply and filtration. Writing in a clear logical style the professor deals with the various phases of these subjects briefly, and at the end of each chapter is found a list of questions which if honestly considered would familiarize the student generally with the whole field of sanitary engineering.

The book is not too deep for city officials and members of commissions who desire limited but accurate information on the subject, and besides affording them this, it will undoubtedly aid them to appreciate more clearly the need and the work of consulting engineers.

DEPARTMENT OF INQUIRY.

The editor of CITY GOVERNMENT will undertake to furnish, through this department, replies to all inquiries pertaining to municipal affairs sent in by subscribers. The names of inquirers will not be published in any case.

Municipal Employment Bureaus.

Will you give me any information you can upon the proposition of cities operating labor bureaus for the benefit of the general public? In our city we have several employment agencies that are irresponsible, often sending men to distant places where there is no work for them, as represented. The idea has occurred to some of our councilmen that if the city should open an agency and operate it, these rather crooked methods might be avoided.

The establishment of a municipal employment bureau, without accompanying legislation to control the private bureaus, would not eradicate the evil practice suggested by our correspondent. It is not likely that the competition of a free municipal agency would be sufficient to drive private parties, especially those descending to fraudulent methods, out of the business.

Mayor Jones, of Toledo, Ohio, has given the subject of employment agencies considerable thought, and in his last message to the council, said:

> The state of Ohio is unique in having a law providing for free employment agencies in certain cities, of which Toledo is one, and the city bears the expense of conducting the office. The absurdity of licensing a private enterprise to carry on the same class of work in competition with the city is apparent. But the infamy of this sort of business can only be understood when we reflect that our people do not go to an employment agency to seek for work save as a last extremity, and that the city should then license an individual to make profit out of this distressed class of people is a flagrant wrong that should be stopped as soon as it is possible to enact the necessary legislation. The state has made a most commendable beginning in the right direction by establishing free employment agencies. Let us supplement this work by enlarging the field of their operations in every possible way so that all of the people may contribute their mite towards finding employment for those who are in need of it.

In a recent letter, Mayor Jones writes: "By reference to my message to the Toledo council you will see that I recommend the passage of legislation abolishing private employment bureaus. The state of Ohio is unique in one particular, and has provided by legislation for the establishment of free employment bureaus in various cities in the state; we have one here; of course, all it does so far is to act as middle man between employers and those seeking employment, but this it does without any expense to the distressed people who are in need of work. I believe it should be made the nucleus of an institution that will find some kind of work for every man who is unable to find work for himself."

Mayor George R. Perry, of Grand Rapids, Mich., writes: "Replying to your favor of recent date on the subject of municipal employment bureaus, I would say: That I think the employment bureaus should be managed by private enterprise, under such regulations as will prevent fraud, and recoup the injured person should any fraud be perpetrated. In this city a license fee of $50 a year is charged for the business, and the person opening the bureau is required to file a good bond in the sum of one thousand dollars; to pay any person injured all damages that may result to them by means of any false information that may be given on the subject of employment. One stiff prosecution was all that was needed to bring the employment agents to the sense of their responsibility. For the last three years there has not been one complaint regarding the management of this particular business. I do not think that the business could be better managed by any one, public or private, than it is in this city."

Public Bath Houses.

Can you give me any information in relation to the construction and management of public bathing houses?

There are in New York city fifteen public houses, located at various points on the North and East rivers. These houses are constructed of spruce, yellow and white pine, and cost from $12,000 to $15,000 each. They are built on pontoons, which support them at the surface of the water. Each house is about 90 feet long by 60 feet wide; in the centre of the interior are two large swimming pools, one for adults and one for children, the depth of the water in the pools ranging from four to six feet. All the way around these pools are small dressing rooms, and on the top of the nouse is a small second-story apartment for the convenience of the attendants.

During the summer months the public baths are open from 6 a. m. to 9 p. m., and in extremely hot weather they are kept open much later at night. Tuesdays, Thursdays, Saturdays and Sundays the baths are open to males only, and Mondays, Wednesdays and Fridays to females only. The baths are absolutely free to all, but all bathers must furnish their own suits, towels and soap. The women attendants, however, are permitted to rent suits to female bathers at ten cents each. Last season about six million baths were given at the fifteen houses, and the expense of maintaining each house, including salaries, repairs and everything, was about $5,000.

Three men and three women attendants are employed for each house, all of the men working from 6 a. m. to 9 p. m. on Tuesdays, Thursdays, Saturdays and Sundays, and all of the women working the same hours on Mondays, Wednesdays and Fridays. On women's days one of the man attendants is constantly on duty, this extra time being shared by the three male employees. The police department also details a patrolman to each bath house.

LEAGUE OF AMERICAN MUNICIPALITIES

Arrangement for the Convention.

The third annual convention of the League of American Municipalities, to be held at Syracuse, N. Y., September 19-22, will undoubtedly be the largest and most interesting gathering of city officials ever held in the world. Many cities have already taken preliminary action toward sending large delegations, among them being the imperial city of New York. The council and board of aldermen of New York usually adjourn for a couple of months during the summer, and before their vacation occurs, the members desire to make proper provision for representation at the Syracuse convention. Therefore a resolution has already passed the board of aldermen providing for the sending of a delegation of ten members of each board and the heads of the various municipal departments. This resolution has now gone to the council, where the action of the aldermen will undoubtedly be concurred in.

A number of other cities are already taking similar action, it being the intention to appoint the delegates as early as possible in order to give them ample time in which to prepare themselves for participation in the discussions of the convention.

Secretary Gilkison says that the membership of the league will show an increase of at least 50 per cent. during the current year, and he counts upon a like increase in the attendance at the annual convention.

Mayor McGuire and the council of Syracuse are already at work upon the arrangements for the big meeting. The following council committees have been appointed and are now actively engaged in preparing for the convention:

Finance—Sager, Soldan, Rice, Flannery and Freeman.

Hotel—Matty, Kruger and Saunders.

Entertainment—Blint, Regan and Evans.

Transportation—Lincoln, Costello and Shuart.

Executive—Mack, Hill, Nies, Kearney and McLaughlin.

Mayors S. M. Jones, of Toledo, W. C. Flower, of Minneapolis, and James Gray, of Minneapolis, constitute the committee appointed to prepare the program of speeches and discussions. Chairman Jones, when in New York recently, stated to "City Government" that the committee would get to work at an early date and endeavor to provide the most attractive program ever offered at a national convention. Mayor Jones thinks that the subjects of municipal ownership, remuneration for franchise rights, municipal contract and day labor systems and public baths and play grounds are of sufficient importance to command a considerable portion of the program. A number of other interesting topics will also figure in the program as finally made up.

The following special features are being arranged for:

Addresses by Governor Theodore Roosevelt, of New York, and Governor Hazen S. Pingree, of Michigan.

A joint debate on municipal ownership to be led by Professor Edward W. Bemis on one side and Allen Ripley Foote on the other, and conducted under a time limit.

Address: "Municipal Control of Public Service Franchises," by Edward M. Grout, president of the Borough of Brooklyn, New York city.

Address: "Duties of Municipalities in Works of Correction and Charity," by Alderman Homer Folks, of New York city.

Address: "Inadequate Compensation to City Officials," by Alderman Elias Goodman, of New York city.

Among the mayors expected to address the convention are: Josiah Quincy, Boston, Mass.; Samuel H. Ashbridge, Philadelphia, Pa.; Samuel M. Jones, Toledo, O.; Carter H. Harrison, Chicago, Ill.; Dr. Conrad Diehl, Buffalo, N. Y.; John H. Farley, Cleveland, O.; Gustav Tafel, Cincinnati, O.; William C. Baker, Providence, R. I.; William T. Malster, Baltimore, Md.; William J. Diehl, Pittsburg, Pa.; Charles P. Weaver, Louisville, Ky.; James M. Jones, Kansas City, Mo.; Thomas Taggart, Indianapolis, Ind.; William C. Maybury, Detroit, Mich.; Henry V. Johnson, Denver. Col.; James G. Woodward, Atlanta, Ga.; R. H. Dudley, Nashville, Tenn.; J. J. Williams, Memphis, Tenn.; James D. Phelan, San Francisco, Cal.; Charles J. Drew, Topeka, Kan.; T. J. Van Alstyne, Albany, N. Y.; John G. Gibson, Utica, N. Y.; George E. Warner, Rochester, N. Y.; Jerome De Witt, Binghamton, N. Y.; J. Adger Smyth, Charleston, S. C.; R. D. Knight, Jacksonville, Fla.; Samuel J. Swartz, Columbus, O.; Henry C. Steeg, Terre Haute, Ind.; H. P. Scherer, Fort Wayne, Ind.; C. T. Briscoll, New Haven, Ct.; Hugh Stirling, Bridgeport, Ct.; S. H. Brashear, Houston, Tex.; John Mac Vicar, Des Moines, Ia.; George R. Perry, Grand Rapids, Mich.; Dr. P. J. Kirschner, St. Joseph, Mo.; H. W. Lynch, Peoria, Ill.; M. M. Stephens, E. St. Louis, Ill.; Warren Penwell, Pana, Ill.; John Redmond, Cedar Rapids, Ia.; Henry Truelsen, Duluth, Minn.; E. K. Tarbell, Winona, Minn.; F. K. Stebbins, Iowa City, Ia.; F. G. Pierce, Marshalltown, Ia.; R. J. Fitzgerald, Great Falls, Mont.; J. A. Johnson, Fargo, N. D.; Charles S. Harvey, Hudson, N. Y.; Dr. John Robinson, Colorado Springs, Col.; Charles W. Bowles, Springfield, O.; L. E. Brelsford, Zanesville, O.; C. S. Bosch, Hamilton, O.; H. Wooding, Danville, Va.

Dr. William C. Woodward, of the Washington, D. C., health department, and Dr. Quitman Kohnke, of the New Orleans, La., health board, will be invited to enlighten the convention on the garbage question.

Judge George Hilyer, of the Atlanta water board, William R. Hill, superintendent of the water works at Syracuse, John C. Trautwine, Jr., chief of the Philadelphia water bureau, and John R. Murphy, water commissioner of Boston, will be asked to speak on the important subject of public water supplies.

Street improvements will probably receive particular attention from such eminent authorities as Andrew Rosewater, city engineer of Omaha, and D. W. C. Moreland, president of the Detroit board of public works.

Hugh Bonner, the most famous fireman in the world, who has just retired from the head of the New York fire department, will be asked to address the convention.

Mayor Levagood Retires.

Mayor M. H. Ievagood, of Elyria, Ohio, the courtly old gentleman who took an active part in the League conventions at Columbus and Detroit, and will be pleasantly remembered by all the delegates, has retired from office. Upon his retirement the Elyria "Reporter" said:

> Mayor Levagood retires from the mayoralty, carrying with him the good will of every citizen. He has discharged the duties of that office impartially and ably. The Reporter has not always agreed with him, but has always had the most implicit faith in his entire sincerity and good intentions. * * * It can be said of Mayor Levagood that he was always and everywhere a gentleman, rendering to every one his just dues and fulfilling every obligation he owed either to individuals or the public. The Reporter wishes him many years of happy life with all the prosperity he is capable of enjoying.

It is to be hoped Mr. Levagood will continue his interest in the League and be present at future conventions.

State Organization in Michigan.

A date for the holding of a meeting for the organization of the Michigan State League of Municipalities has been agreed upon by five mayors of the principal cities in Michigan, and Mayor Perry of Grand Rapids, has issued invitations to the conference. The place of the meeting will be Lansing and the time May 23, Tuesday, at noon. The officials who have been instrumental in developing the interest which has lead to the action are Mayors Maybury of Detroit, Loennecker of Jackson, Stearns of Kalamazoo, Baum of Saginaw and Perry of Grand Rapids.

—The Montauk Multiphase Cable Company have arranged for an exhibit of their automatic thermostatic fire detective cables at the Paris Exposition next year. The company will make a very complete exhibit of their fire detective wires in connection with all interior electrical adaptations, and it will undoubtedly be one of the electrical features of the fair.

—The board of fire commissioners of New Orleans, La., have voted to contract with the Manchester Locomotive Works for two of their latest improved Amoskeag steam fire engines. One is a third size engine, and the other is a double extra first size steam propelling fire engine. This latter engine is one of the largest guaranteed water capacity engines made, the capacity guaranteed being 1,350 gallons.

—The convention of Municipal Electricians to be held in September of this year at Wilmington, Del., promises to eclipse any previous convention in numbers and exhibits. The progress of municipal fire protection from its beginning down to the present will be illustrated by apparatus in vogue during the various stages of invention. The Montauk Multiphase Cable Company will have a complete display of their product in connection with all interior wiring.

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SPECIAL NOTICE

City officials and friends of City Government visiting New York are cordially invited to make the office of City Government their headquarters during their stay in the city. Desks, stenographers and stationery are placed at their disposal, and their mail may be addressed in our care.

ANOTHER LARGE FILTRATION SCHEME.

We are in receipt of the report of the Filtration Commission of Pittsburg, Pa., which has recently been published, including the report of the consulting engineer, Mr. Allen Hazen; the report of the consulting bacteriologist, Prof. W. T. Sedgwick; the report of Mr. Emil Kuichling upon a gravity supply from Indian Creek, and the report of the resident engineer, Mr. Morris Knowles, and others.

The scope of the work of the Commission and the various specialists employed, is set forth in the beginning of the report of the Commission to the Council as follows:

First—To thoroughly investigate the character of the present water supply of the city of Pittsburg in relation to public health.

Second—To ascertain the effect of sand filtration.

Third—To ascertain the advisability of establishing a sand filtration plant for the city of Pittsburg.

Fourth—To present an estimate of the cost of establishing and maintaining the same.

Fifth—To investigate the feasibility and advisability of seeking other sources of supply.

Sixth—To report its findings and recommendations, together with such evidence as may be useful for the guidance of the council of the city of Pittsburg in acting prudently and for the best public interest in this matter.

In view of the fact that many cities throughout the country are discussing the question of a purer water supply this report becomes of great interest, the more so since the scope of the report was not limited to the determination of the best means of purifying the existing water supply, but also contemplated a new supply by gravity. The city of Philadelphia, for instance, has long had under advisement a purer water supply. All seemed to agree as to the necessity of changing the present character of the water supply, but the rock upon which the various advocates split has been whether the city shall secure a pure water supply at first hand, or a purified water supply by means of some method of filtration. In any instance there seems, however, to be no doubt as to the advisability of securing a pure water rather than a purified water supply (except in the minds of some filtration hobbyists), if the same can be secured at anything like an equal cost, and it is this phase of the Pittsburg report that we deem of most importance at this time.

The report contains nothing surprising concerning the character of the present water supply or its terrible state of pollution. It is a fundamental proposition among sanitarians that sewage once entering a stream will never wholly disappear or be eradicated no matter what may be the length of the river or the distance traveled by the water, and this fact is strongly dwelt upon by the various specialists to which the commission intrusted the various departments of the work. The consulting bacteriologist employed by the Commission emphasized this point, declaring that the character of the watershed of the Allegheny river was such as to rapidly transport the sewage of the population on the watershed almost intact to the people in Pittsburg, and that the river has proved to be a most effective vehicle for those particular kinds of bacteria which point unmistakably towards extensive sewage pollution. He further finds that typhoid fever is not uncommon on the watershed of the Allegheny and that the germs are speedily delivered by the river at Pittsburg with none of their vitality or virulence lost. These are strong facts and would make one consider long and look far for some pure source of water supply before attempting the always somewhat doubtful process of filtration, in which the actual experience at Lawrence, Mass., has proved that the experimental tests and percentages of bacteria removed are always larger by several per cent. than the reports of actual every-day working of the continuous filters in practical operation, whether sand or mechanical. This is a many times repeated experience in cities both abroad and in this country where filtration has been established. The bacteriologist concludes that in all probability the use of the river water is a principal source of the constant and excessive amount of typhoid fever in Pittsburg.

This sums up the situation as it is at present, but the perusal of the report of the consulting engineer shows that this is by no means the most alarming condition. We find from this report that of the fifty-nine towns with a population of nearly 300,000 on the watershed, only the larger ones are sewered, and that the population at present contributing sewage is only a fraction of the total population stated. He further states that "the populations are increasing rapidly, however, and the use of sewers even more rapidly, so that the amount of polluting matter entering the river, already considerable, is sure to increase rapidly." This fact so strongly impressed itself upon the mind of Mr. Hazen, the consulting engineer, that he expresses a doubt as to whether the Allegheny river at the point now proposed even with filtration will be a suitable source of supply for the city of Pittsburg for a period longer than forty years.

As these facts concerning the Allegheny river water were known even before the Commission began its work, it seems remarkable that no attempt was made to secure a pure water supply rather than a purified one until two years out of the two and a half years during which the Commission pursued its investigations had elapsed. This would seem to point to some unexplained prejudgment in favor of some method of filtration as against the securing of a pure water supply either by pumping or gravity on the part of the consulting engineer to whom this important investigation had been entrusted by the Commission. More and more it is becoming evident to the general public that absolute freedom from such prejudices or prejudgment in favor of some particular technical method or scheme greatly enhances the value of the services of experts having in charge such large and responsible investigations. The people have the right to fair and impartial judgments on the part of the specialists to whom such large retainers are paid. But to-day it is an undeniable fact that specialists seem more anxious to prove their pet theories and to advance at any hazards their own particular hobbies than fairly and unbiasedly to consider every obtainable fact. To establish their own specialties they will often even ignore facts which but for this bias of their minds would appeal to them as demanding thorough and careful consideration although not materially altering their findings. One-idead men are valuable scientifically speaking, but one-ideaed men directing important investigations may be greatly detrimental to the interests of the city entrusting to them its welfare with the hope of receiving from their hands unbiased, exhaustive and comprehensive consideration of every question involved.

That this general criticism suggests itself in the matter under review is not to be wondered at when we repeat that two years out of two and a half years elapsed before any unpolluted source of water supply was considered and that even then such an investigation was forced to notice by outside parties interested in the city's welfare. As a result of this delay Mr. Kuichling, the engineer employed to investigate an unpolluted source of supplyand to report to the consulting engineer complained that he had inadequate time (less than six months) in which to pursue his investigations of a supply the consideration of which involved more difficulties and more actual work and surveys than all the filtration systems combined upon which so much longer time and many times more money were lavished. If then the consulting engineer lacked sufficient details for a just comparison of the two methods, filtration and gravity supply of pure and unpolluted water, should not the lack be attributed to a want of desire to obtain such facts in the first instance.

From a perusal of the report we cannot but conclude that more mature consider-

ation of the gravity scheme would have altered the conclusions found by the Commission, at least in some degree, and would have enabled them to give to the people of Pittsburg a fairer comparison and report upon all phases of the water question at Pittsburg.

We will take, for example, but one point which the report fails to consider, viz.: that of loss by reason of the difference in hardness between the filtered water of the Allegheny and the pure water of the Indian Creek. The report shows that the hardness of the Allegheny river water is 122 per cent. greater than that of Indian Creek—in other words, they are as 5.25 is to 2.04. This percentage is based upon the reports of the filtered water from the Allegheny, the filtering process hardening the water more than in its normal condition. The financial aspect of this question was, however, not considered by the consulting engineer, who, reporting adversely against all machanical filtration processes also ignores facts which were not favorable to the one scheme, viz.: that of sand filtration. The effect of this hardness on the amount of soap used in a city such as Pittsburg, where one must continually wash if he would be clean, is certainly worthy of being taken into consideration. It makes no difference whether money is paid out for taxes, in water rates or for excessive soap bills, it is on the aggregate cost to the people that the comparison in costs of the various systems should be made. The reports of the largest soap and washing compound manufacturers make one dollar per annum per capita a very low estimate of the soap used in cities which have a soft water supply, and the reports of the State Board of Health of Massachusetts place the amount of soap consumed in hard water supplies, at more than double those of soft water supplies, so that an estimate of 50 cents per capita saved in soap alone by the use of the soft waters of Indian Creek is putting it at a very low figure, and this one item alone would amount to a total saving per annum of $150,000 in favor of the waters of Indian Creek, not to speak of the greater purity and agreeableness in its use. Adapting this percentage of cost to the table of comparative costs as prepared by the consulting engineer we have:

AVERAGE ANNUAL CHARGES.
(Adapted from Hazen's Table.)

	Estimate of population last date.	Gravity supply soft water.	Present supply with filtration.	Excess of cost of filtration scheme.
1900-1910..	420,000	$460,000	$510,000	11 P. C.
1910-1920..	560,000	582,000	627,000	12 "
1920-1930..	740,000	652,000	814,000	10 "
1930-1940..	920,000	768,000	1,022,000	33 "
1940-1950..	1,100,000	972,000	1,232,000	26 "

From the table given it will be seen that even had this one feature been considered the cost of the gravity supply would have been less than filtration. But this is not the only financial consideration of this phase of the subject. The report of the resident engineer states that the unfiltered turbid waters of the Allegheny are better for boiler purposes than the filtered water; he therefore, by inference states that the soft, pure water of Indian Creek is vastly superior to the filtered water of the Allegheny. It does not seem a difficult task to convert this superiority into a dollars and cents basis, and in a city like Pittsburg, the money saved should unquestionably have been an important factor in the determination of the source of supply. It was, however, totally ignored.

Another argument used by the consulting engineer against the gravity supply besides that of excessive (?) cost, is that after the year 1950 the supply obtainable by gravity from Indian Creek would have to be augmented from other sources, but he overlooks in his conclusions the fact that he has also stated that in forty years the Allegheny water will have become so polluted that even with filtration it may be unfit for use. But we take issue with him on the question of the time when the gravity supply will have to be augmented, for his conclusions were based upon facts obtained, not from the study of the conditions as they actually exist on the Indian Creek watershed, but upon the rain fall and flow of the Sudbury River near Boston, Mass., a river whose watershed it is stated is classed "among those which yield the smallest percentage of the precipitation as stream flow, so it will be prudent to base our computations for storage and run off upon the data relating thereto."

It will thus be seen that the very worst light has been put upon the question of yield from this source of supply, which from the investigation of the actual facts had been altered even in a slight degree in favor of a greater production on the Indian Creek watershed would have materially affected the cost and the length of time for which a gravity supply could be obtained. The estimate based upon the adoption of these small factors compelled the design of a reservoir to hold 346 days' supply, it being assumed by them that no rain would fall and no snows melt during that length of time in a section noted for its floods and swollen streams.

The Commission, on the recommendation of the consulting engineer, have reported the adoption of sand filtration over mechanical filtration. The first cost of the former is about 25 per cent. greater than the latter, but it is claimed by the consulting engineer that mechanical filters will cost more to operate, so that the total cost of either system is practically the same. P.

RAILROAD GRADE CROSSINGS.

Mayors and councilmen, insist that the railroads shall minimize the danger at grade crossings within the city limits. This is one of the most important of the duties imposed upon you, for it involves the safety of human life. You are elected to protect the life and property of your fellow citizens. When you have provided a fire department, a police force, a health bureau, etc., your work is not done until you have made the railroads stop maiming and killing your people.

In a number of the larger cities, progressive public officials have begun the abolition of grade crossings by requiring the railroad companies to elevate their tracks. In smaller towns, where the elevation of tracks is impracticable, it is well to regulate, by ordinance, the speed of railway engines and cars while passing through the corporate limits. A good ordinance for this purpose is in force at Urbana, Ohio, and it says:

Section 224. It shall be unlawful for any person or persons, engineer, conductor or railroad company, to run or propel any locomotive or railroad car on any railway track within the corporate limits of the city of Urbana, between Light street on the north and east and Roher street on the west, and College Way and the Madriver pike on the south, at greater speed or velocity than the rate of eight miles per hour, and every person or persons, engineer or conductor running a locomotive on any railroad track within the limits of said city is hereby required to ring the bell continuously upon such locomotives as he may be running through said corporate limits. If any person, engineer, conductor or manager shall violate any of the provisions of this section, he or they shall forfeit and pay for each and every offense a fine of not less than ten dollars nor more than fifty dollars with costs.

Section 225. It shall be the duty of the city marshal, and all officers of the police, and they are hereby invested with full power, to arrest upon view or information and without process any person or persons violating section 224 and bring him or them before the mayor.

The strict enforcement of this ordinance at Urbana has had the desired effect. Railway trains no longer cut off the limbs and heads of men, women and children at Urbana. Such an ordinance ought to be on the book and strictly enforced in every city and town where grade crossings must be endured.

MAYOR McGUIRE DID RIGHT.

Despite reports in sensational daily newspapers, it is not at all likely that Mayor McGuire, of Syracuse, will be impeached on account of the recent "riot" in that city. The "riot" was an orderly move on the part of indignant citizens in tearing up about 300 feet of "T" rails laid by the street railway company in violation of the law. On the night of this action Mayor McGuire made the following statement:

The citizens in the vicinity of Butternut street did exactly what was right this evening. They have been abused and goaded by the railroad company beyond the point of endurance. They arose in righteous indignation and demonstrated for once that they owned the street.

The Rapid Transit Railroad Company usurped the right to leave the T-rails in the street. My opinion is that the people had a right to remove the rails and I told them I would not interfere. The company cannot show any consent or franchise permitting the existence of the rails in the street. So the people were determined to assert their rights, and they tore the wretched apology for a railroad track out of the street they own.

I furnished police and ample protection to protect the cars and the other property. But I refused to make the people desist from the work of removing the rails, because I believe their action was fully justified. The crowd was large and enthusiastic, but perfectly orderly and all of one mind.

Mayor McGuire is right. The people have a perfect right to protect the streets they own from unlawful use by street railway companies.

—Several streets at Galion, Ohio, will be paved with brick this season.

—The contract for the excavation and concrete work on the proposed middle service sewer for the District of Columbia, to be located near Brightwood, has been awarded to R. A. Malone, of Lancaster, Pa. His prices on this work were: For excavating 30,000 cubic yards of earth, at 40 cents per cubic yard, estimated cost, $12,000; for concrete work, 11,000 yards at $7.20 per yard, estimated cost, $79,200.

—August Dieman has secured the contract for paving on Clinton and South streets and Broadway, Waukesha, Wis. His bid was: Excavation, 23 cents per cubic yard; filling, 50 cents per cubic yard; setting curb, 44 cents per foot; resetting curb 8 cents per foot; protection curb, 21 cents per foot; paving $1.31 per square yard; cast iron gutter bridges, 45 cents per foot; catch basins, $10; catch basin covers, $6.50; lamp-hole covers, $2. Galesburg brick will be used.

WATER DEPARTMENTS.

Water Waste at Minneapolis.

Some weeks ago the water works committee of the Minneapolis, Minn., council appointed a special committee consisting of Registrar Frank T. Moody and Supervisor John H. McConnell to investigate the waste of water in the city. The report of Messrs. Moody and McConnell shows abuses that are common in many cities, and will be read with interest by city officials. It is as follows:

"We first began with the public institutions, including the pumpage at the various stations, using the two lower stations as a check against station No. 3; the reservoir and reservoir pipe lines, and then took up in their order the city hall, court house, fire engine houses, public schools, the state university, public library, the automatic flushers for sewers, and the various submerged mains, and then we made a thorough house inspection of enough of the blocks and residences as to give your committee something of an idea of the waste of city water. We have arrived at some conclusions which we will embody in this report, together with our recommendations.

"Beginning with the North Side station, we find that according to the revolution counters there were pumped at the North Side station for the two days preceding April 4, 1899, at 8 a. m., 36,196,300 gallons of water, or an average per day of 24 hours of 18,098,150 gallons. April 4, 1899, at 8 a. m., the pumps at the North Side were shut down, and the gate on the reservoir pipe line was turned off at the pump house, the supply of the city was then drawn from the two lower stations, pumping direct. The gate between the east division and the west division was turned off, leaving the East Side pump to alone care for that side, the two "Jumbo" pumps located at station No. 1 supplying the west division alone.

"We will present the following table which will give you the amount of water pumped per watch of eight hours each, at each station:

"Station No. 2, located on Hennepin Island, 8 a. m., April 4, 1899, run until April 6, 1899, 8 a. m.

Time—	Gallons pumped.
8 a. m. to 4 p. m., April 4, 1899.....	1,120,000
4 p. m. to 12 p. m., April 4, 1899.....	976,000
12 p. m. to 8 a. m., April 5, 1899.....	949,120
8 a. m. to 4 p. m., April 5, 1899.....	1,106,304
4 p. m. to 12 p. m., April 5, 1899.....	939,770
12 p. m. to 8 a. m., April 6, 1899.....	807,840
Total gallons pumped in 48 hours..	5,899,040
Average per day.....	2,949,020
Average per capita East Side.....58 gallons	

Station No. 1, located at the foot of Fifth avenue, south.

Time—	Gallons pumped.
8 a. m. to 4 p. m., April 4, 1899.....	4,882,240
4 p. m. to 12 p. m., April 4, 1899.....	3,326,900
12 p. m. to 8 a. m., April 5, 1899.....	3,267,000
8 a. m. to 4 p. m., April 5, 1899.....	3,969,400
4 p. m. to 12 p. m., April 5, 1899.....	3,729,800
12 p. m. to 8 a. m., April 6, 1899.....	3,271,800
Total gallons pumped in 48 hours..	22,447,140
Average pumped 24 hours.....	11,223,570
Average number gallons to supply whole city	14,172,590
Per capita for whole city.....70½ gallons	

"It will be observed that with the reservoir pressure it required 18,098,150 gallons per day, or a per capita use of 90 gallons to supply the city, while with direct pressure it required 14,172,000 gallons per day, or a per capita use of 70 1-2 gallons. It will also be seen that during the night hours from 12 p. m. to 8 a. m., under the direct pressure, there were pumped for the two nights, 8,295,760 gallons, or an average of 4,147,880 gallons for the eight hours each night, when in fact there should be scarcely any use of water during that time, and we feel warranted in saying that 3,000,000 gallons of this is waste. The apparent discrepancy between the reservoir and the direct pumpage is explained in this way: Reservoir pressure on the gauge in the office is sixty pounds, and the pressure maintained in pumping direct was only forty pounds. It will be seen that under these conditions more water would be forced through the same openings under the reservoir pressure than in pumping direct. There may be some slippage at the North Side, but we are unable to say at this time how much.

"We find for the 24 hours following the 24 hours ending April 6, 1899, at 8 a. m., there were pumped at the North Side, 20,245,273 gallons, or a per capita use of 101 gallons per day; this amount of water pumped is simply out of question at any time of the year. What will it be in summer? The conditions are such that methods should be adopted at once to obviate this waste. We know that at this time of the year one-half of the above amount is more than sufficient to supply the city. This would allow every man, woman and child fifty gallons per day.

"We would recommend, that so far as the North Side pumps are concerned, cards be taken of the cylinders, and the amount of slippage ascertained to a certainty; also that a Venturi water meter be placed on the main supply pipe at the North Side. You would then be in a condition to contract for your fuel intelligently, as you would know absolutely how much water was pumped.

"Using the above figures for a basis, there is an apparent discrepancy between the North Side and the two lower stations of 6,000,000 gallons per day in round numbers. Allowing a difference of one-third in the pressure, we find there are still about 2,000,000 gallons unaccounted for. Can it be possible that this represents slippage? About 10 per cent. of the amount shown by the counters.

"We find that the reservoir and reservoir pipe lines are tight, there bing no leakage whatever.

"In regard to the school houses, we have inspected 50, and find that there is a great waste of water in these buildings. The detailed report shows that there is an unnecessary waste of water in these buildings of at least 1,600,000 gallons per 24 hours. Faucets were found removed, and a great number of closets leaking. We found in some cases the waste in the basements was such that water could not be drawn on the upper floors. As the pipes supplying these particular buildings are from 1½ inches in diameter to 2 inches in diamter, it will be seen how much water goes to waste.

"The new city hall and court house was found in the best possible condition, only one small leak in one of the closets.

"The old city hall was found in bad condition, with many thousand gallons going to waste daily in this building.

"All blocks and buildings on Hennepin and Nicollet avenues, as far back as Franklin avenue, and all buildings on Washington avenue, north and south, which were not supplied through meters, were thoroughly inspected, and in 459 buildings it was found that 114 closets were leaking, 67 were badly or wide open, 47 closets with small leaks, 4 baths and 33 faucets with small leaks.

"At the Chicago and Milwaukee and St. Paul railway shops we find that there is an immense quantity of water used legitimately, but considerable waste.

"In regard to sewer flushing, we are of the opinion that there is a great use of water. We find 71 automatic flushers running continually. These flushers are provided with 5-8-inch connections with the mains, and if they were located close up to the tank they would pass through each 24 hours under 9,000,000 gallons, but allowing for friction, it is safe to say 4,500,000 gallons would pass through these connections. In connection with the above we will add that this matter was taken up with the sewer department, and it was stated by Mr. Ilstrup that all the automatic tanks were tested during the year last past, and that all connections were turned off as far as possible, and that the consumption by actual test was between 500,000 and 600,000 gallons per day.

"The state university and buildings are supplied with one eight-inch and one two-inch pipe, and immense quantities of water are used through these connections for which the city receives no revenues. We find no authority for the granting of free water to the state, or can we see why the consumers of city water should pay the water tax for the state of Minnesota. We would be pleased to receive from you definite instructions in regard to this matter.

"In the above plumbing we find many very bad leaks. Running water to the extent of three one-half inch pipes are kept open in the frog and fish ponds at all times, and it is safe to say generally there is at least three inches of water going to waste.

"In conclusion we will say that we are of the opinion, based on what we have discovered, that there is a waste of water in this city of at least one-half the water pumped, and that fifty gallons per capita per 24 hours is large.

"We are of the opinion that there is only one definite way to reduce the waste of water to a minimum, and that is a complete meter system. We would recommend that the ordinance governing the use of city water be so amended that the committee on water works would have the right to install the meter system, and that the system first be adopted in all of the commercial dis-

tricts of the city and be gradually extended so as to embrace the whole city. If this were done at once we feel justified in saying that new pumps would be unnecessary. We would also recommend that all meters set should be owned, set and maintained by the city, a small rental for the meter based on the cost and life of the same, being charged. This charge would be so small that it would be infinitesimal, and would not be felt by anyone. At the same time the machine would be paid for when worn out. The meter system is the only business proposition. A very small rate should be made for all public places, and meters placed on the same. All places where there is running water should be stopped in this way. Let the departments pay from their appropriation sometning, and the waste will stop. The city should first stop its own waste before requiring the people to economize.

"As to house inspection to stop the waste, we are of the opinion that it would require at least 10 men, and even then the result would be unsatisfactory."

Report of Sioux City Water Works.

Superintendent E. B. Spalding, of the Sioux City, Ia., water works, has submitted his report for the first fiscal year the plant has been in charge of a board of trustees. In it he outlines first the condition of the properties of the water works board when received from the city council, and explains what has been necessary to do to put the pumping stations, etc., in their present good repair. A comparison is made between the year during which the water works have been in charge of the board and the last year in which they were in charge of the city council. The board's expenditures amounted to $20,106.59, while those of the previous year were $20,959.33. But according to the report, the board has increased the receipts from water rentals $6,356.98 without having caused any raise in the water rates.

The report says: "There are now 443 meters in use. In my judgment, meters should be placed upon all service pipes where there is a sewer connection and upon all service pipes for lawn sprinkling. The water departments of all cities are recognizing that this should be done, and in many cities meters are being required on all of the service pipes above named. If this was done in Sioux City it would solve the problem of water supply for years to come. The careless, useless and in many cases the wanton waste of water equals, or nearly equals, the actual needful use."

Schenectady Water Report.

The report of the Board of Water Commissioners of Schenectady, N. Y., for the last fiscal year has just been printed. The total pumpage for the year was 1,759,059,261 gallons, a daily average of 4,819,340 gallons. The population of the city is given at 24,374; there are 33 miles of mains, 351 hydrants and 4,850 water consumers. The bonded indebtedness of the water board amounts to $497,000, and the sinking fund to $69,086.66. The receipts for the year amounted to $90,670.06, of which $52,395.05 came from water rents and $32,000.00 from sale of bonds. The disbursements were: Pump house, $18,192.28; street department, $9,252.13; construction of mains, $16,738.72; interests on bonds, $17,870.00; rebates, $207.50; erroneous water taxes from 1886 to 1897, $907.72; final payment on pumps and boilers, $6,404.64; construction of dwellings at pump house, $12,911.74; expenses of bond sale, $180.48; sinking fund, $8,004.85.

Water Department Items.

—The water company at Quincy, Ill., will lay about two and a half miles of new mains this summer. One hundred laborers will be engaged on the work.

—The annual report for 1898 of the city engineer of Providence, R. I., shows the following interesting facts pertaining to the water works: Number of services in use, 20,473; number of meters in use, 16,388; average daily consumption, 9,148,993 gallons; daily per capita consumption, 54 gallons.

—The decision in the case of the water company against the city of Danville, Ill., is in favor of the city, the court holding that the city had the right under the law to pass an ordinance fixing a less rental for fire hydrants than was fixed in an earlier ordinance. The reduced rental is $50 per hydrant.

—The village of Howard, S. D., will put in a water works system this summer. The cash in the village treasury, with the license revenues for the next year, will lack but a few hundred dollars of covering the estimates. This amount will be raised at once by popular subscription and the plant put in and paid for without bond or debt.

—The Continental Filter Company have closed a contract with the owners of the Louisiana, Mo., water works for an extension of their filtration plant, the water works people having thought so well of the improved system of sedimentation in connection with coagulation that they have decided to allow them in the extension of this plant to introduce their entire system. This town is located on the Mississippi river and the water at times is very turbid, but the contract covers a high standard of purity.

—Harvey Cockell will succeed Jere O'Shaughnessy as superintendent of the water works at Columbus, Ohio, on May 20. He was born in England in 1849 and served his apprenticeship as engineer and millright in the big establishment of Nelson & Son, Wakefield. He afterward started up for himself and operated what is known as the Oak foundry at Wakefield. In 1872 he came to America and settled in Chicago, where he was engaged in the manufacture of brick. Afterward he was superintendent of machinery at the Interstate exposition. He has lived at Columbus about fifteen years.

UTILIZATION OF REFUSE.

A pamphlet recently issued by W. F. Morse, sanitary engineer, on the "Disposal of Refuse and Garbage" gives some interesting facts and information concerning the utilization of the refuse of cities, and points out that there is sufficient value to the refuse to more than cover the cost of its collection, removal and the distruction of the worthless matter, without the slightest nuisance or complaint. Mr. Morse is interested in a particular form of refuse distructor which has been installed at Boston, Mass., since January, 1899, and the pamphlet states that "the operation of the plant demonstrates perfectly that every condition has been fulfilled."

FREE MUNICIPAL CONCERTS.

Up to date the Music Commission has given in the various districts of the city twenty-three free chamber concerts. The artists have been a quartette of instrumentalists, a pianist and a vocalist at each concert. The works performed have been of the highest musical kind, comprising compositions by Mozart, Haydn, Raff, Wieniawski, Boccherini, Sarr, Bremer, Schumann, Paderewski, Taubert and Herold. The vocal numbers have been drawn from the compositions of song writers of the best school.

The audiences were limited only by the size of the hall, and it is estimated that nearly 20,000 have listened to the programs offered by the artists during the season.

The Music Commission is at present planning the open-air concerts for the summer season, and have engaged the services of thirty-seven well known musicians to constitute the Municipal Band for the season. The position of director will be filled by Mr. Emil Mollenhauer, whose work as director of the series of Music Hall concerts during the winter season was so well received by the musical critics and the public generally.—"City Record," Boston, Mass.

GARBAGE CREMATION AT GRAND RAPIDS.

Under date of April 30, the board of health of Grand Rapids, Mich., makes its first report to the council on the operation of the new Engle garbage crematory in that city. The furnace is a double one, each side having a capacity of 50 tons of garbage per day. Fires were started on October 26 and since then about 1,200 tons of garbage has been cremated. The expense has been $332.09 for fuel and $761.34 for labor, a total of $1,093.43, or about 91 cents per ton of garbage consumed. The board hopes to reduce this expense.

ASSYRIAN ASPHALT ROOFING.

Following is a copy of the specifications for Assyrian asphalt composition roofing:

Cover the roof boards with 3 or 4 ply of "Assyrian" asphalt felt, weighing not less than sixteen (16) pounds, single thickness, to the square of one hundred (100) feet. The felt to be evenly laid and cemented together the full width of lap with "Assyrian" mineral rubber roofing cement, fastened to the roof boards with nails and tins, at intervals of 3 feet (or mopped to cement or tile roof). All joinings along the walls and around the openings to be carefully made. Place a heavy felt flashing along all walls and around all openings, secured to the walls with lath and 10-penny nails, and well mopped with asphalt mineral rubber. Edges to down spouts, conductor heads and gutters well turned down, and secured to the roof in the same manner. The roof to be then covered with a thorough coating of "Assyrian" mineral rubber roofing cement, and fine, clean screened and washed gravel imbedded in the cement. If put on in cold weather, the gravel to be heated. The roof to be guaranteed for a term of ten years.

This roofing material is absolutely unaffected by the elements or by the extremes of heat or cold, will not run or crack, and is consequently indestructible. The roofing composition will stay without the assistance of gravel upon steep roofs, having a pitch of six or eight inches to the foot. The three-ply roof weighs from five to ten pounds to the square more than the ordinary four-ply roofs, the excess weight being in asphalt and not in paper pulp.

FIRE DEPARTMENTS.

Change of Meeting Place.

This year's convention of the InternationalAssociation of Fire Engineers wili not be held at Columbus, which was the place selected at the St. Louis meeting. The retirement of Chief Heinmiller, of the Columbus fire department, upon whose invitation the association decided to meet in that city, will necessitate a change. President Twingley has called a meeting of the executive committee at Cincinnati for May 10 for the purpose of choosing a place for holding the annual convention, the formal withdrawal of

CHIEF JOHN P. QUIGLEY, SYRACUSE.

Chief Heinmiller's invitation being at hand.

As this form of "City Government" goes to press before the date of the committee meeting, we must anticipate its action. It is almost certain that the committee will select Syracuse, N. Y., as the place for holding the convention. Chief Quigley, of that city, has renewed his invitation to the association to meet there, and it will undoubtedly be accepted. Syracuse is an excellent place for a great national convention, being easily accessible from all quarters, extremely hospitable and a most interesting city.

Bonner Out—Croker In.

On May 1, Hugh Bonner was succeeded as chief of the fire department of New York city by Edward F. Croker. Chief Bonner resigned in order to establish a school of fire extinguishment.

Hugh Bonner had been in the fire department since 1853, and when but a lad he ran with the Lady Washington Engine Company, No. 40. In 1861 he was made a foreman in the company, and served with it until 1865, when the paid department was organized and Bonner was at once appointed a foreman and attached to Engine Company No. 20. While acting in this capacity he operated the first self--propelling fire engine and chemical engine ever used in the department.

In May, 1873, he was made chief of battalion and assigned to the second district, in which were located many of the large dry goods and other mercantile houses. Here again he was foremost and operated the first water tower ever used in fighting fires. He was appointed second assistant chief in 1883, and it was while he was in that position that he organized the first school of instruction. A year later Mr. Bonner was appointed first assistant chief, and in 1889 he reached the highest rung in the ladder he had been climbing for so many years, and was appointed chief of the department.

Edward F. Croker, the new chief, has been in the department for fifteen years, and his record is an enviable one. He as worked his way up from the ranks by meritorious service. The new chief is a nephew of the Tammany leader.

Rules of Firemen.

The following sections of the new rules and regulations for the New York fire department are of general interest:

House watchmen shall not permit visitors after 9 o'clock at night except by order from an officer, which order or permission shall not be given to the same person on more than one occasion. The house watchmen will immediately exclude from quarters any persons who may enter or attempt to enter quarters for the purpose of soliciting orders or collecting bills. Female visitors, unaccompanied by male escorts, will be permitted to enter company quarters as far as the patrol desk only and then state their business to the house watchman, who shall make an entry in full on the company journal.

Not sell or assign his salary or incur or contract any debts or liabilities which he is unable or unwilling to pay, or neglect or refuse to honorably discharge and promptly pay all indebtedness, claims and judgments and satisfy all executions that may be held or issued against him; or commit any assault or breach of the peace or do any act by wh he can or may be arrested, confined or imprisoned and prevented from performing his duty as an officer or member of the department, and in case of his arrest and confinement he shall be considered as absent without leave during such time of detention.

No officer or member, whether in uniform or not, shall smoke on the apparatus floor or in the dormitory of quarters, or in the streets or public squares when in uniform; where there is no provision for a sitting room in quarters officers and members will be permitted to have seats, or to smoke in the rear part of the apparatus floor.

Not use obscene, immoral, disrespectful, impudent or improper language, but always be respectful and gentlemanly to superiors, equals and citizens, and courteous to subordinates.

Not neglect, refuse or evade any duty, or fail to take notice of any infraction of the rules, or of any conduct or action of any officer or member of the department, which he is in a position to see, or of any language which he may hear and which may be prejudicial to the good order, welfare or reputation of the department, and he shall ascertain the true facts and conditions in every case to which his attention may be called for the purpose of acting as a witness.

Not (excepting in cases of actual necessity) mount or dismount from the steps of the apparatuses of the department in front of the wheels while they are in motion.

Not enter in uniform any place where intoxicating beverages of any kind are sold for meals or for any purpose whatever except in the strict discharge of public duty.

Not at any time be under the influence of spirituous, malt or intoxicating beverages, liquors, drugs or compounds sufficiently to interfere in any way with the proper performance of every duty, whether it be the direct or immediate influence or sickness caused or produced by the use of such beverages, liquors or compounds.

Not to be a delegate or representative to or a member of any political or partisan convention, the purpose of which is the nomination of a candidate for any political office.

Not be guilty of cowardice, nor shrink from any duty.

Not unnecessarily disturb men asleep in dormitory.

Officers and members will not be eligible for a second advancement until after a service of one year in the rank to which they nave been promoted. Exceptions will be made only for meritorious acts performed in the rescue of life at fires.

Jersey City Fire Department.

The annual report of the board of fire commissioners of Jersey City, N. J., shows that the manual force of the department consists of one chief engineer, two battalion chiefs, one clerk of the board, one medical examiner, one inspector of horses, one superintendent of telegraph, five telegraph linemen, twenty captains, fifteen engineers, fifteen stokers, thirty-five drivers, five tillermen, forty-five hosemen and twenty-five truckmen. The force is divided into fifteen engine companies and five hook and ladder companies. The total expenditures for the year amounted to $221,898.79, of which $181,662.19 went for salaries, $2,187.11 for pensions, $3,999.68 for new hose, $4,200 for new steam engine, $5,520.25 for new engine house and the remainder for repairs and supplies. During the year there were 430 alarms; total loss, $205,637; total insurance, $527,370; insurance paid, $196,429.

School of Fire Extinguishment.

Hugh Bonner, who has resigned as chief of the New York fire department, will be at the head of a college of fire extinguishment to be established soon in New York.

According to Chief Bonner the objects

of the college will be to instruct individuals in the best means of preserving and protecting their own lives, as well as those of their families and neighbors; to instruct them in the means of extinguishing and preventing fires, and the proper methods of exit from buildings on fire. There will be preparatory classes to instruct candidates for the fire and police departments, employees of hotels, theatres, business houses, office buildings, janitors, and all others who are responsible for the protection of life as well as property.

There will also be general inspections and surveys of all classes of buildings by the best and most skilled experts.

The school plans to go further and give practical instruction to firemen in the department and those who propose entering it. It will give diplomas to graduates, and it is hoped to make these in great measure take the place of civil service examinations for candidates.

The course of instruction will, according to the prospectus, comprise a thorough training in every branch of fire extinguishment. The daily program will consist of the instruction of classes in company drill, school for engine company, school for truck companies, school for pompier corps, and lectures on some subject having relation to fire service. The course will extend over a period of three months.

It is proposed to completely equip the school with steam fire engines, hose, ladders, derricks, trucks, scaling ladders, reels, hose wagons, and all appliances in actual use by leading departments. There will be a post graduate course of three weeks for higher officials and graduates. The prospectus further says:

"The business of fire extinguishment has been raised to a skilled science. It is impossible, in the present state of things, for any one to enter upon the profession of a fireman, and exercise the judgment and responsibilities and intelligence required in this calling without many years of actual experience.

"It is a well recognized fact in many of our smaller cities and communities generally that the limited experience to be derived in such places does not and cannot fit the firemen and chief officers for successfully executing, in all instances, the duties attaching to their positions and calling.

"It is proposed to place before those entering the school practical instruction and demonstration in all that relates to fire extinguishment, use of appliances, and equipments. This instruction will be imparted by the leading fire chiefs and subordinate officers of the United States, by those actively engaged in the service of the leading cities to-day, and by professional men having to do with fire prevention and fire extinguishment in different branches."

Another of the interesting adjuncts of the school will be the employment as instructors of the most capable of the retired members of the fire department, all of whom are devoted to Chief Bonner.

An Electrical Fire Engine.

A patent has just been granted to Mr. William H. H. Whiting for an electric fire engine, which is at once simple in construction and novel in design. It has not yet been given a practical trial, but if all that is claimed for it is realized, it promises eventually to supersede the steam fire engine, and at the same time to save a good deal of the expense incident to the maintenance and care of steamers.

The engine, which is mounted on wheels like a steamer, consists simply of a rotary pump and an 85 horse-power electric motor, and the machine can be used wherever there is an electric plant. The electric engine is 25 per cent. lighter than the average steam engine, and its motor has double the power of an average steamer's pump.

The electrical engine is so arranged that its working is absolutely controlled by the hoseman at the nozzle of the hose. The engine is designed to throw a maximum of four streams, and it can be made to throw this number, or three, or two, or one, at the will of the hoseman.

There are two streams from either side of the engine. If one stream is shut off, the relief valve lifts and shuts off a part of the current; if both streams are shut off by the hoseman, the action of the relief valve causes the controller to shut off the entire current, thus stopping the engine. The opening of the nozzle of the hose puts the engine in operation again.

Thus it is obvious that a skilled engineer, who is necessary in the management of a steam fire engine, is not a necessity with the electrical engine. Indeed, with this electrical machine, the engineer has nothing whatever to do while the engine is at work except to keep oiled four bearings on the pump and two on the motor. Any man who can run an electric car is competent to care for an engine such as Mr. Whiting has designed.

The current for running the electric motor could be obtained by erecting a post about ten feet from each hydrant, and connecting this with the nearest source of electrical supply. The current would be transferred from the switch-box on the post to the engine by two flexible conductors, which could be attached instantly, and the engine would be ready for use before the hose could be laid. In small towns, where it was desired to avoid the immediate expense of putting in independent currents near each hydrant, current could be brought over to the hydrants from the nearest trolley wires.

Non-Choking Horse Collar.

After years of experimenting at last a non-choking horse collar has been produced. It took a "fire laddie" to do it, too. Mr. John A. Weider, of Rochester, N. Y., became a volunteer fireman at eighteen years of age and continued in the service of his city in that capacity until after the department was organized on a paid basis. Not infrequently he noticed that the horses would be more

thoroughly winded than a short run would make possible. The cause, he soon discovered, was a defective collar. Interesting himself in the general subject, he endeavored to find a collar free from this fault, but was unsuccessful.

Not long after this he left the fire department to enter the business world on his own hook, naturally choosing to manufacture something which would sell to the department he loved so well. Here he commenced his experiments with horse collars. After many failures his perseverance was rewarded by the production of an ideal collar—one which would permit of an extension and which could not choke the horse. The accompanying cuts will demonstrate the perfection of this remarkable invention. Mr. Weider is to be congratulated upon his achievement. These collars have already been put in service in the leading cities of eight states, and it would be a most profitable investment for every department to order a set of these collars at the earliest opportunity.

Fire Department Items.

—At Newport News, Va., W. J. Weymouth has been elected chief and S. S. Cunningham assistant chief of the fire department.

The Upper Peninsula Firemen's Association will hold its annual convention and tournament at Marquette, Mich., August 9, 10 and 11.

—John V. Huffort has been elected chief of the fire department of Allentown, Pa. He has been in the fire service for twenty years.

—The city of Yonkers, N. Y., has been authorized by act of the legislature to appropriate $2,000 for the convention of the New York State Firemen's Association, to be held there in August.

—The tenth annual convention and tournament of the Vermont State Firemen's Association will be held at Bennington on July 19 and 20. The convention will meet on Wednesday, July 19, and the tournament will be held on Thursday.

—The American Fire Engine Company, at its Cincinnati works, has received an order for a second size Metropolitan engine from Washington Fire Company, No. 2, of Madison, Ind. The steamer at present in use with this fire company was built at the Cincinnati factory and has been in continuous service for twenty-eight years.

—The Vajen-Bader Company, of Indianapolis, manufacturers of the popular head protector of that name, have just equipped the United States transports with their device. This company have a very large foreign business, as well as domestic, the purchasers being largely the fire departments, mines, breweries, cold storage plants, etc. Among the recent sales made are five helmets to the Westport Coal Company, Wellington, New ealand; three to the Boston and Montana Consolidated Silver and Copper Mining Company, of Butte, Mont.; Anaconda Copper Mining Company, of Butte; Seattle Brewing and Malting Company, and Pittsburg Consolidated Coal Company.

—The Montauk Multiphase Cable Company have recently opened an office in Boston, Mass., Brazer building, 27-29 State street, at which place the various electrical adaptations of the cable are shown upon individual boards and sections of the dangerous parts of buildings and how they are wired for detecting fire are graphically illustrated. The company's business field is very rapidly developing, and many installations are now being made in various parts of the country. The recent disastrous fires in New York and Boston have created a demand for this cable as being the only reliable device known for giving timely warning of dangerous heat or flame, allowing ample time for the suppression of the fire and escape from danger.

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FRANCHISES TO BE TAXED IN NEW YORK

The franchises of railway, gas, electric light, telephone, telegraph, heat, power and all other companies using space on, over or under the surface of the public thoroughfares are to be taxed in New York state hereafter. The Ford bill, amending the general tax laws of the state so as to bring all franchises within the meaning of the term "real estate," was passed on the last day of the session of the Legislature.

The important point of the amendment is that it provides for the taxing of franchises as real estate instead of as personalty. This means that whatever tax the assessors levy cannot be sworn off, nor can indebtedness be offset against it.

The new law will add several hundred millions of dollars to the assessed valuation of property in New York city and many thousands of dollars to the assessment rolls of all the other cities of the state. In New York city the Metropolitan Street Railway Company, the Third Avenue Railroad Company, the Manhattan Elevated Railroad Company and the Consolidated Gas Company alone will be required to pay about $3,500,000 additional taxes annually. When one stops to consider the large number of other companies which own valuable franchises in the metropolis, the magnitude of the results of the new law become apparent. It is said by competent judges that the annual taxes from franchises in New York city will amount to about $23,000,000.

Senator John Ford, the author of the bill, in a recent interview said:

"Assessors will experience no difficulty in arriving at a taxable valuation of public franchises, and the new law will, in my opinion, work without friction or difficulty.

"Criticisms of it, on the ground that it is crude and incomplete, such defects are due, not to the form of the bill, but to the imperfections of the general tax system of the state, for it should be remembered that the bill creates no new machinery and does not change the present tax law at all, except by amending the definition contained in that law as to what shall be real estate for the purposes of taxation under it.

"What it aims at is the very valuable rights which transportation corporations possess and enjoy in the public streets. The transportation corporation gets a corporate franchise from the state like any other corporation, and it gets in addition from the locality, by consent of the property owners and of the local authorities, a grant of a most valuable easement in the public streets, a species of property which has been defined as real estate from the dawn of civilization. The Court of Appeals has declared that this easement amounts to an estate in perpetuity in the street.

"It would have been a simple matter to have prescribed a rule to govern assessors in valuing this kind of property, for its value can be arrived at by a very simple method which has been substantially adopted in taxing these properties in other states, notably Indiana.

"For example, the total assests of the Metropolitan Street Railway Company consist of:

"First, in the value of the company's investment in its railways and other appurtenances—in other words, the cost of reproducing the entire plant. That is all tangible property and represents every dollar that the company has put into the road.

"Second, there is the value of the public franchise. Now the aggregate market value of the stock of the company plus the aggregate market value of its indebtedness is equivalent to the total value of all the assets, tangible and intangible, the investment of the company and the public franchise possessed by the company.

"This is easily demonstrated. The bonds are secured by a mortgage on the assets of the company. They constitute a lien prior to the stock; the stock, therefore, cannot be worth one single cent until after the company possesses assets to secure the debts of the company and earning capacity sufficient to pay the interest thereon. When the stock sells in the open market for any price it is evident that there are assets over and above the indebtedness equivalent to the market price of the bonds. The value of the debt and the value of the stock added together represent exactly the total value of all the assets possessed by the company.

"Under the law, as it stands, it is the duty of the assessors to appraise and place a valuation upon all the tangible assets of the company—that is, all the entire investment of the company in the railway.

"The assessors can also easily find, from quotations on the Stock Exchange daily, the price of the securities of the company, and, therefore, the total value of its assets. Deduct the value of the tangible property and there remains the value of the intangible, or a public franchise.

"Now, I was adverse to prescribing this method by statute for the valuation of these properties, because it would compel the assessor to assess them at one hundred cents on the dollar, where, as we know, other kinds of property are not, as a matter of fact, assessed so high, but average all the way from 50 to 90 per cent. in different parts of the state.

"I wanted the bill to be as fair to the corporations as to ordinary property owners, and have simply left it to the assessor to assess them with the same discretion he exercises in assessing all other

"I realize the inequality of assessments kinds of property.

upon all kinds of real estate, and I suppose there will be inequalities in assessing a public franchise, and if the ordinary property owner is to be subject to those inequalities and the injustice which grows out of them, why should not the owner of a public franchise be subjected to the same conditions? Why does the possessor of a public franchise demand for his property a different mode of treatment from that applied to other persons' property?"

THE NEW YORK GAS WAR.

Gas in New York city can now be had at 50 cents per thousand feet, on account of a fight between the four companies in the field. These companies had an agreement on the division of territory. It was what is termed, in railroad parlance, "a gentlemen's agreement," but during the past few months violations of the compact have been frequently reported and the relations between the gentlemen of the various companies became so strained that an open war was declared about May 1. The Consolidated and Mutual Companies were the first to act, both announcing a reduction in the price of gas from $1.10 to 65 cents on the same day. A day or two later the New Amsterdam and Standard Companies met the issue with a cut to 50 cents.

The officers of all of the companies state clearly, and without qualification, that the cut is a war measure and that they will lose heavily on gas sold at the reduced price. Therefore, there is not the least bit of sense in the claim of the New York "Journal" that the reduction was made in deference to its crusade, on behalf of the people, for cheaper gas.

MUNICIPAL LIGHTS AT LOW COST.

The board of water and electric light commissioners of Cumberland, Md., have made a report on the first six months' operation of the new municipal electric plant.

The first cost of the entire plant was $18,286. The running expenses for six months, including labor, coal and maintenance, and also interest, have aggregated $3,191.11. There are in operation 186 arc lights of 1,200 candle power each, which burn all night every night. This would make the total cost of each light, interest included, $17.15 for six months, $34.30 per annum, $2.86 per month or one cent per hour. The cost per annum, $34.30 per arc light, is the lowest on record. Under former contracts with a private company Cumberland paid $91.25 for each 2,000 candle power light per annum. Fifty-six cities of the same size as Cumberland (20,000 population), who have no municipal plants and buy their lights, pay at an average of $95.67 per arc lamp per year. Baltimore pays $127.75 per year for 2,000 candle power lights.

Mr. Isaac Hirsch, the father of the municipal plant movement, is delighted over the results at Cumberland, believing them to be more than a complete vindication of his position when he led the fight for the plant. Depreciation is not added in the above cost. Allowing 3 per cent. for this the total cost of each lamp would be $37.53 per annum.

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THAWING FROZEN WATER PIPES BY ELECTRICITY.

(CONTINUED FROM PAGE 108.)

agers of water works plants and their patrons.

The public is greatly indebted to both Professors Jackson and Wood for this timely discovery and generous gift. There is no more tearing up of streets in winter and with it a probable endangering of the mains; no more danger of destroying the hydrant valves by steam; and the cost of the thawing out is brought within reach of every one.

As soon as it became known that success had been met by the electric thawing process, others wanted the credit. They at once claimed the right of "I knew it first; we used it long ago." If such was the case, why did they keep their discovery so quiet that it never was heard of outside of their city? Why did they let their fellow citizens suffer? We should always give credit to whom credit is due ,and not endeavor to wrench the laurels from the victor's brow. If we thought electricity could be used, but made no effort to bring it into use, we deserve no credit.

I will now give you the computations Professor Jackson was kind enough to give me, and which have been verified in the different cities where the conditions were proper and the thawing successful.

To thaw out lead or iron services up to one and one-half inch, you should use from 200 to 250 amperes; if you are not able to get more than 125 amperes, it will take four times as long. If you use over 250 amperes you are liable to get into trouble by overheating the corporation cock, stop-cock and all other brass connections.

Wrought-iron pipe must be watched very closely so that the joints do not heat; it has lower resistance, higher conductivity, requiring more current, in order to make more heat, therefore you must watch the unions—that is where the heat occurs.

It is necessary to use a source of current which does not affect the electric light lines or other transmission lines; if current is taken from them, danger may result. We have therefore ordinarily used a transformer in the work, but in some cases have used dynamos directly. The source of current should have a pressure of not less than 50 volts. To thaw out 500 feet of a six-inch main in half an hour requires 800 amperes; if you are unable to get more than 400 amperes it will take four times as long, or two hours. Eight hundred amperes will thaw out 500 feet of a 12-inch main in one hour and a 24-inch main in two hours, etc. The source of current for water mains should have a pressure of not less than 200 volts.

In preparing to thaw out a water main, connect with two hydrants, winding the wire around the hose nozzle. Screw hydrant nozzle cap up to the wire, making a close connection, commence at open end, where there is no frost, with 800 amperes or less and 200 volts, and thaw say 500 feet at a time. Water should be kept running for at least an hour after main has been thawed, as it will take that length of time before water will be slightly warmer. Three-quarter H. P. will thaw a six-inch main in half an hour per foot length; two-tenths H. P. will thaw a one-inch, and one-eighth H. P. will thaw a five-eighths service pipe in half an hour per foot length. There is no danger from electrolysis, on account

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a Trench Pump for Contractors and Water-Works. It has a capacity of from 1,800 to 6,000 gallons per hour, OPERATED BY ONE MAN.

Why use steam power when you can save money by having one or more of our Pumping Outfits? Two men can move them about from place to place. They will pump water containing sand, gravel and sewerage matter without perceptible wear.

Every city and contractor in the New England States has from one to seventy-five of our Pumping Outfits. Over 50,000 of these pumps sold in the last ten years. Send us your order, and if after thirty days' trial the outfit is not satisfactory it may be returned to us free of any expense to you.

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of the short duration of the thawing process and the ground being frozen.

Herewith are the directions for thawing service pipes up to one and a half inches in diameter, which were prepared and sent out by the University of Wisconsin:

"The current which is required for thawing service pipes satisfactorily is from 200 to 300 amperes. The source of current should have a pressure of not less than 50 volts. Where electric light lines carrying alternating currents are available, a transformer or transformers in parallel may be used as a source of current. It is very important that direct connection of pipes to house lines be avoided on account of danger of fire in which the house is placed by such connection.

"Where alternating currents are not available continuous current feeder lines may be used, but these should be entirely separated from the distributing net work of conductors.

"The way in which the appliances should be connected when an alternating current is used with transformers is as follows: The secondary leads from the transformer should be quite large, such as No. 3 B. & S. gauge, or larger. In making connection to the pipes, one of the secondary leads should be taken into the house to which the frozen service pipe leads and contact made at that point by some form of metallic clamp or by simply giving the conductor two or three tight twists about the pipe at any point where the pipe is exposed or at a faucet in the house. The other secondary lead should be put in contact with the water system outside of the house and in a similar manner. This contact may be made at a hydrant or at an adjoining service box, or pipes in a neighboring house. When there are two houses near together, each with frozen service pipes, the two secondary leads may be connected to the pipes within these houses and both frozen service pipes thawed out at once.

"While the thawing process is going on, the faucet should be open in the house to which the service pipe leads. In one of the secondary leads should be inserted a water resistance which consists, for convenience, of a bucket of water containing a bowlful of salt, and two sheet-iron or copper plates to which the ends of the severed lead are attached. This serves to control the current. In the primary leads from the electric light line to the transformer it is highly desirable to have a fuse in each lead, and an amperemeter. When all connections are made, the plates are placed in the bucket and are then moved towards each other until the amperemeter records a proper current. If the primary pressure is 1,000 volts and the secondary pressure 50 volts, the current should ordinarily approach 15 amperes. If the primary pressure is 2,000 volts, and the secondary pressure is 50 volts, the amperemeter reading should ordinarily approach 7.5 amperes.

"Water ordinarily begins to flow in a time not much less than ten minutes or not greater than one hour. If the secondary current is quite close to 300 amperes the period seldom exceeds one-half hour. The frozen pipes are often split by the action of the frozen water, and these at once begin to leak when the ice is thawed away. For this reason it is desirable to have a plumber where he may be readily called to care for the leaky pipe.

"The electric current when properly used will not damage the pipes. It is desirable to watch brass and iron connections to lead or iron service pipes, as they some times heat on account of poor contact. If such heating appears to be excessive, the current may be reduced with a resulting increase in the duration of time for thawing.

"After the pipe has been thawed it is desirable to let the water run continuously for a considerable time, inasmuch as the ground all round the pipe is frozen and the pipe is liable to freeze up again unless the water circulates."

In closing this paper let me give you an extract from an insurance paper as to the financial result of this discovery: "A slight estimate of the value of the invention of thawing out frozen pipes by electricity to underwriters can be found from the fact that in 1898, insurance companies paid out nearly $300,000 in losses caused by primitive methods of thawing out pipes."

Notes and Comments.

The Seagrave Company, Columbus, Ohio, are putting in considerable overtime filling orders for their well-known trussed ladders and trussed trucks, hose wagons and all styles of combination pieces, and are compelled to add a large addition to their works to produce these well-known goods fast enough to fill orders on hand, the merits of these goods being thoroughly appreciated by the progressive cities and towns of the country.

Los Angeles, Cal., is about to receive a Seagrave full trussed hook and ladder truck, with trussed truck frame and trussed ladders, purchased from Seagrave & Co. through their Pacific coast sales agent, Mr. R. S. Chapman.

The Seagrave Company, Columbus, O., are shipping goods to various parts of the world, a recent order by mail having been received from Chatham, N. B., Canada, which, after investigating the various hook and ladder trucks manufactured, awarded the contract to this firm in consequence of the great strength and extreme lightness of Seagrave trussed ladders and trussed trucks.

Hastings, Neb., is about to receive a service hose wagon from the works of the Seagrave Company, Columbus, Ohio, sold by Mr. Julius Pearse of Denver, Col.

Leadville, Col., recently placed an order through Mr. Julius Pearse, of Denver, Col., with the Seagrave Company for one of their latest improved No. 8 full trussed hook and ladder trucks and one combination chemical engine and hose wagon, after having received prices and investigating various makes of goods.

Bushnell, Ill., has just placed an order with the Seagrave Company for an improved special hose reel.

Missouri Valley, Iowa, desiring to have a first class hose wagon, to be delivered in time for the tournament to be held in that city in June, has placed an order with the Seagrave Company, through the New York Belting & Packing Company, of Chicago, for one of their latest improved No. 1 hose wagons.

Defiance, Ohio, after seeing the apparatus made by the well-known firm of the Seagrave Company in use in various cities, placed its order with this firm for one of their latest improved combination

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Handling Dirty, Gritty and Sandy Liquids without Wear, Oil or Care. Pumping Outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps and other Machinery always on hand. Exchanging.

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Studebaker Bros. Mfg. Co.,

Broadway and Prince St., New York City.

trussed hook and ladder trucks and chemical engine, deciding in favor of the trussed goods in consequence of their extreme lightness and great strength.

The council of Jackson, Ohio, having sent a committee to Columbus, Ohio, to inspect the goods made by the Seagrave Company, being satisfied of their superiority, placed an order with this firm for one of their latest design hose wagons, to be built like all other goods manufactured by this concern, according to the special requirements of their city.

THE BIG FOUR.—The four large cities of the middle West owe much of their present prosperity to the most excellent service afforded by the world-famed "Big Four Railway." With its geographical centre at Indianapolis it stretches itself out to the north, south, east and west, like so many helping hands. Through its beneficent influence populous centres, great and small, have sprung from the earth as by magic. The four cities will soon have multiplied one hundred fold. In equipment and management this system is all that could be desired.

"C. H. & D."—These cabalistic letters stand for the Cincinnati, Hamilton and Dayton railway, a system which has long since outgrown its name. Its founders built more wisely than they knew. Originally designed for the traffic between three cities in close proximity to each other, it has intersected as many states. Push, enterprise and progress reveal the secret of its large success.

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—Captain Isaac P. Haulenbeck, of Newark, N. J., has probably seen more years of active fire service than any other man in this country. He was a member of the Newark fire department for fifty-one years, during which time he served as engineer at one house for thirty-five years. During his long service he was never transferred and charges were never preferred against him. When he retired in 1896, he had attained the rank of captain. Captain Haulenbeck was born in Morris county, N. J., 78 years ago, and is to-day lively and in good health.

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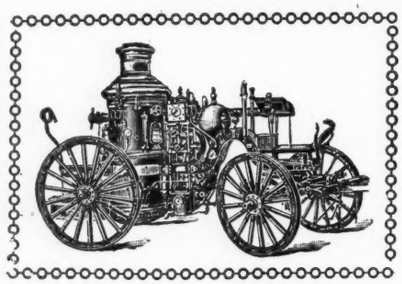

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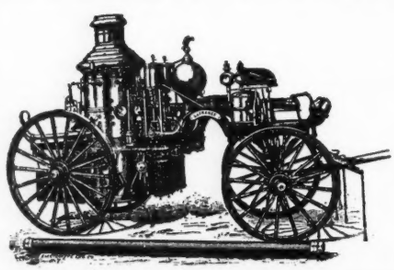

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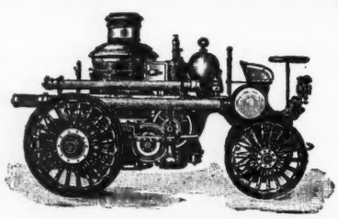

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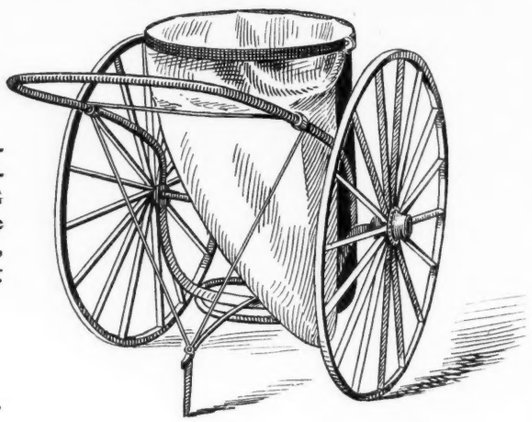

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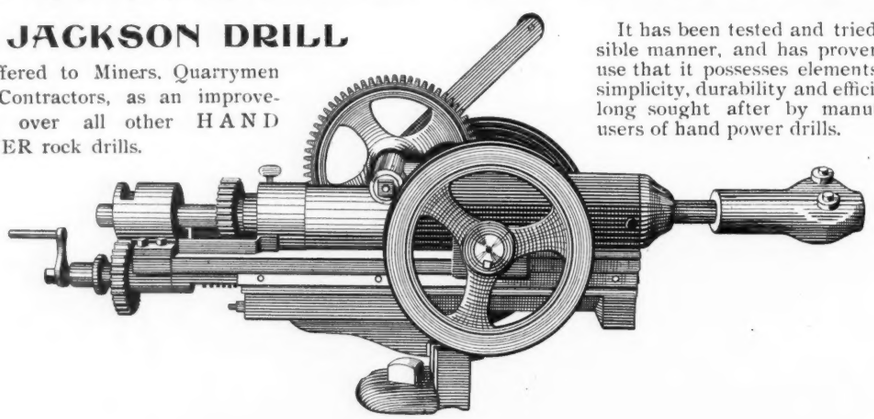

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